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May 4th 1880.

THE
DIAGNOSIS AND TREATMENT
OF OBSTETRIC CASES

BY

External (Abdominal) Examination
and Manipulation.

BY

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PREFACE.

THE object designed in the preparation of this essay has been fully stated in the introductory pages, viz.: to furnish the English-speaking portion of the medical profession with a complete epitome of the subject of Palpation in Obstetrics—a subject almost entirely neglected in English obstetrical textbooks. The essay, while thus intended to some extent as an article for reference, particularly aims at the practical object of popularizing the methods which it describes. It is, therefore, designed chiefly for the use of the student and embryo obstetrician, not for the obstetrical expert, who is, or should be, familiar with all it contains.

The drawings for the cuts were made for me, under my directions, by my friend, Dr. A. H. Fridenberg, to whom I again desire to express my thanks. The complex nature of the various parts has prevented the three last cuts from being as clear as was desired. They express the position of the hands, however, and thus fulfil their object.

PAUL F. MUNDÉ.

20 West 45th Street.
NEW YORK, March 30th, 1880.

THE DIAGNOSIS AND TREATMENT OF OBSTETRIC CASES
BY EXTERNAL (ABDOMINAL) EXAMINATION AND
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BY

PAUL F. MUNDÉ, M.D.,

Obstetric Surgeon to Maternity Hospital, New York.

"Malgré ce laps de temps écoulé, le sujet peut être considéré comme neuf."
—*Bulletin de l'Acad. Impér.*, Tome XXV., p. 157.

SEVEN years ago, towards the close of a prolonged stay in Vienna, I conceived the project of preparing an exhaustive paper on the various modes and procedures by which abdominal examinations and manipulations are conducted during pregnancy and labor, and the numerous and different conditions in which their employment is beneficial or necessary. Perhaps I should scarcely have thought of writing on a practice so well known to all German obstetricians and physicians, and so universally taught and exercised in Germany, had I not frequently seen in the lying-in wards in Vienna, as well as during my previous three years' term of service as clinical assistant to Scanzoni in the Maternity Hospital at Würzburg, how little the young American medical graduates, even from our best schools, know of *practical* obstetrics, and particularly of external diagnostic and therapeutical manipulations of pregnant and parturient women. That this inexperience is not confined entirely to our young practitioners was proved to me by a remark made by an American physician, an intimate friend of mine, and one who had seen a large number of obstetrical cases in this country, who, while witnessing the ease and rapidity with which the period of gestation and the fetal position were ascertained by external examination in a number of cases in the reception wards of Prof. Spaeth's clinic at Vienna, expressed his delight at the procedure, and surprise that it is so little known and practised in the United States. I was reminded by this remark of the entire absence of any mention of this practice during my own studies at the Yale and Harvard Medical Colleges, and of

my sad ignorance in this respect on arriving in Europe after my graduation, which facts fully corroborated my friend's observation. As for ever having seen the manipulation, that possibility was out of the question, for it is still one of the great and universally acknowledged defects of American medical instruction (and one, as we all know, difficult to remedy in our land of universal equality) that but an extremely small proportion of our medical students have occasion to examine, perhaps not even to witness, an obstetrical case, and consequently the majority learn this most important branch solely from their text-books. This has been my own experience, as it undoubtedly has also been that of all those students who were not so fortunate as to enjoy the exceptional advantages offered them as internes in the lying-in wards of some of our large hospitals. So far as I have been able to learn, however great the advances in the other branches of medical instruction have been, in the department of practical obstetrics there has been but little improvement since I left my Alma Mater thirteen years ago. A simple labor or a forceps or other operative case seen at a distance from the benches of an amphitheatre, or a chance confinement case in dispensary practice, are something, it is true, and better than nothing, but can scarcely be called *practical instruction* in obstetrics.

While in Vienna, I received from my friend, Dr. William L. Richardson, of Boston, a pamphlet on "External Manipulation in Obstetric Practice" which he had read before the Mass. Med. Society in June, 1871, and in which he briefly describes the practice, and deplores the "little attention which has as yet been paid to the subject in this country," and warmly recommends it to the profession.

On looking over the numerous German and other European obstetrical authors then at my disposal, I found that few make more than cursory mention of the details of abdominal manipulation, Scanzoni¹ and Schroeder² giving the longest and clearest accounts I was able to find. The journal literature on the subject I also discovered to be by no means extensive and generally but little known. This fact may, at first sight, appear curious and unfavorable to the method, but it can readily be explained, when we consider that it is taught at all medical

¹ *Geburtshülfe*, Vol. I., 1867.

² *Geburtshülfe*, 3. Auflage, 1872.

schools in Germany as a matter of course, and that familiarity in exercising it must be acquired by practice, and cannot be learned theoretically.

Of American authors I was able to ascertain only four who had written special essays on this subject. Prof. M. B. Wright, of Cincinnati,¹ Whittaker,² John Drury,³ and Wm. L. Richardson;⁴ all of whom, with the exception of the last named, referred principally to the manipulation for the purpose of version, hardly mentioning its *diagnostic* value.

Bedford, in the last edition of his work on the "Principles and Practice of Obstetrics," published in 1870, declares the whole subject of external manipulation in obstetric practice to be still "*sub judice.*" Byford alone, in his "Theory and Practice of Obstetrics," recommends version by external manipulation in those cases when the patient is seen early in labor, and in his second edition (1873), pp. 358 seq., clearly describes the operation and gives an illustrative woodcut. Of *diagnostic* external examination neither says a word, and it is to this, therefore, that I desire to call special attention in this paper.

On this point Richardson (*loc. cit.*) says: "While the use of external manipulation in the *treatment* of obstetric cases has received but little attention, its application as an aid in the *diagnosis* of the fetal position is a subject which has not been thought deserving of even a passing allusion."

While recently revising this paper, Dr. E. Noeggerath, whom I questioned about the literature, referred me to a most valuable paper of his on "The Operation of Turning by External Manipulations, considered from a historical and practical point of view. With Cases," published in the *New York Journal of Medicine*, November, 1859, which gives almost precisely the same literature as quoted by me and goes over the therapeutic procedures very thoroughly, so far as they were practised twenty years ago. I have made frequent use of this paper in the preparation of Chapter II. of this article.

Influenced by these considerations, and fully acquainted as I had become with the examination and manipulation in all its

¹ On Difficult Labors and their Treatment, 1854.

² On the Rectification of the Fetal Position by External Manipulation. Phila. Med. and Surg. Rep., Dec. 18th, 1869.

³ Turning the Fetus in Utero by External Manipulation. Phila., Feb. 27th, 1869.

⁴ Loc. cit.

features from my oft-repeated experience in over 1,200 cases of gestation, as clinical assistant and tutor at the School for Midwives in Würzburg, and in fully 1,000 more during a ten months' stay in Vienna, a detailed paper, not only on the therapeutical, but chiefly also on the diagnostic value of the procedure, seemed to me not out of place, and I immediately set to work in Vienna, during the winter of 1871-'72, to collect the necessary data, intending to finish the article at once, and send it to this country for publication. An eight months' tour through Europe, however, prevented its completion at that time; since my return from abroad I have repeatedly thought of revising and finishing it, and had indeed completed it almost to the condition in which I now present it, three years ago, when it was again laid aside for more pressing work, until now, when I hope the subject has become neither uninteresting nor hackneyed—less important it certainly is not than it was seven years ago.

In consequence of my dilatoriness, several short papers on single branches of my subject have gained precedence, the most important of which is undoubtedly that by my friend, Dr. James R. Chadwick, of Boston, on "Palpation in Obstetrics, as practised in Germany,"¹ to which paper, as well as to that of Dr. Richardson, I am indebted for numerous valuable hints.

Of the other papers published within the last eight years, only two, both written by Dr. Frank C. Wilson, of Louisville, Ky., discuss the main question of my paper, obstetric diagnosis by palpation. They are entitled "Fetal Physical Diagnosis" and appeared in the *American Practitioner* for Dec., 1873, and Dec., 1875, the first paper containing an "analysis of the physical examination" of 126, the second of 106 cases. Additional articles, chiefly referring to the nature, frequency, variations and importance of the fetal pulse as recognizable by auscultation have been contributed by Parvin, Underhill, Cummings, Naylor, and several others, to all of which I shall refer in the course of this communication. The publication of these articles, in my opinion, in no wise interferes with the object of

¹ *Boston Med. and Surg. Jour.*, Aug., 1872.

That the subsequent papers have by no means exhausted the subject, and that an article on "Palpation in Obstetrics" is still called for in this country, is shown by the almost verbatim republication by himself of Dr. Chadwick's paper of 1872, in the *Amer. Practitioner* for Nov. and Dec., 1876.

this paper, for, as will be seen, I purpose to cover a much wider field than any or all of the recent productions above mentioned.

The last and most potent inducement not to delay longer the publication of this paper, on which I have spent so much time and labor, has come during the past autumn in the shape of a book by the well-known French obstetrician, A. Pinard, of Paris, on this very subject. His work, entitled "Traité du palper abdominal au point de vue obstétrical et de la version par manœuvres externes," as the title shows, treats of the subject as fully as may well be done, and has met with great attention in France. Pinard confirms my own previous statements, when he says that "at present abdominal palpation is practised by a small number of obstetricians; but how small is the number of practitioners who employ it and recognize its importance!"

Dr. Pinard has, in my opinion, done a great service by collecting and systematizing all the data of obstetric palpation; and what he has done for France, I am endeavoring to do in a more humble way for those of our brethren who are not familiar with the French language. Surely, if further justification were needed for the *raison d'être* of this article, this is justification enough.

Before proceeding to a historical sketch of my subject, I wish distinctly to state that it is not the ordinary superficial manual examination of the abdomen of a woman supposed to be pregnant, rapidly practised under the clothes, to ascertain the approximate size of the uterus and the probable presence of a fetus, which is briefly described in all the text-books and doubtless familiar to every one, to which I here refer; but the systematic, scientific, and accurate manipulation, by which in most instances we ascertain the existence of pregnancy, the position intra, approximate size and general condition of the fetus, and the relations of the uterus; by which a mal-position may frequently readily be rectified, the expulsion of the placenta facilitated, post-partum hemorrhage prevented or arrested, and any abnormalities in form or texture of the upper portion of the uterus and its appendages and of the abdomen detected.

If much of what this paper contains is familiar to many of my readers, I nevertheless trust that there may still be some

to whom the information here imparted is new, interesting, and valuable, and for them this article is written.

HISTORICAL SKETCH.

As will be seen, the literature of this subject, up to within the past few years, is confined entirely to the therapeutic employment of external manipulations, their diagnostic utility not being recognized until quite recently.

Although, for completeness' sake, I might begin with Hippocrates, and recount the rude and imperfect methods by which the ancient Greeks and Romans, and later the Arabian physicians, endeavored to rectify the abnormal position of the fetus, for practical purposes it suffices to commence our historical sketch with the revival of medical science after the Middle Ages, when the practice of midwifery was by popular consent taken from the hands of women who, according to all accounts, exercised their vocation in the most barbarous manner, and intrusted to scientifically educated male physicians.

In the sixteenth century, Eucharius Rösslin (1513) and A. Rueff¹ (Zürich, 1554) in their *Mammals of Midwifery*, first give accounts of a method of version by means of external and internal manipulation, of which Rueff especially gives a tolerably clear description, a free translation of which is as follows : "The parturient woman shall be ordered to her bed by the midwife, and shall be placed on her back, with her head low and her pelvis high. Then a dexterous woman is to stand at the head of the patient, and shall seize the abdomen with both hands and lift, pull, and direct it gently towards herself; the midwife sits before the patient and waits, and crouching down shall give aid by pushing and directing the child so as to bring it with both thighs and the breech backwards or upwards towards the back of the mother, also to turn the child so that it can be born naturally, with the head below, etc." More than a hundred years later we find the very same advice given by Dr. John Pechey.²

Up to this period the rules for both internal and external examination and manipulation were of the most simple and gen-

¹ Ein schöa lustig Trostbüchle von den Empfangknüssen und Geburten der Menschen, etc. Zürich, 1554.

² Compleat Midwife's Practice. Enlarged by Dr. John Pechey, 1698.

eral kind, and could lay no claim to scientific value or perfection. Mauriceau (1668) was the first to teach obstetrical exploration in a scientific manner, and Puzos,¹ while materially improving the art of obstetrical diagnosis, called attention to the fact that pregnancy may be recognized by means of the combined exploration per vaginam and per abdominem as early as the third month. Although later Levret,² Baudelocque,³ Jörg,⁴ Kiwisch,⁵ Holst,⁶ Veit,⁷ and others laid stress on the importance of this method, and although it is the only means of diagnosing pregnancy in the earlier months, still it has not become as universal as it should be, and as the present state of perfection in physical examination in all the branches of medical science would lead us to expect.⁸

The diagnosis of the pregnant state in the later months is, of course, generally attended with no great difficulties, but, notwithstanding attention was called by Roederer⁹ to the value of external exploration for this purpose, it is only within the last half century that it has gradually become a well-known and comparatively common practice. Schroeder even says on page 76 of the third edition of his "Midwifery," published in 1872, "that the importance of external examination for the diagnosis of pregnancy in the later months has not been properly appreciated until quite recently."

The first methodic and scientific account of external manipulation in its application to *cephalic version* was published in 1807 by Dr. Wigand of Hamburg in the medical journal of that city,¹⁰ and sent five years later as a dissertation to the universities of Berlin and Paris, without, however, attracting public attention. Wigand placed the woman on her back on an ordinary bed, and with one hand gradually pressed the breast

¹ *Traité des Accouchemens, publié par Morisot Deslandes,* 1759.

² *L'art des acc.* Paris, 1761, § 448.

³ *L'art des acc.* 8th ed., Paris, 1844, § 371 seq.

⁴ *Taschenbuch für pr. Aerzte u. Geburtshelfer.* Leipzig, 1814.

⁵ *Klin. Vortr. über Krankh. d. weibl. Geschl.* Prag, 1854.

⁶ *Beitr. z. Gyn. u. Geb.* Tübingen, 1867.

⁷ *Krankh. d. weibl. Geschl.* Erlangen, 1867.

⁸ See Thomas, *Dis. of Women,* 1874, p. 63, line 15.

⁹ J. G. Roederer, *Elem. art. Obstet.* Gottingæ, 1753.

¹⁰ Von einer neuen und leichten Methode die Kinder zu wenden und ohne grosse Kunst und Gewalt zur Welt zu fördern. Hamburger Mag., 1807, 1. B., p. 52 and three essays, etc., Hamburg, 1812., p. 35.

of the child upwards towards the fundus uteri, and with the other the head downwards towards the brim of the pelvis; the fetus was then kept in its rectified position by means of pillows applied to the abdomen and chiefly to the spot where the feet were to be felt, and the woman was instructed to lie principally on the side to which the head appeared most inclined to move. If the version was attended with any difficulty, Wigand gradually brought the head nearer the pelvis by placing the woman for some time on the side where the head was situated, relying on the inclined plane of the ilium and the leverage of the fetal breech falling to the other side to bring the head down. This procedure was put into practice during the latter part of gestation, and repeated if necessary.

Wigand's method, although practised and appreciated in Germany, did not become generally known to the remainder of the professional world until the Corsican physician, A. Mattei, published a book entitled "Essai sur l'accouchemement physiologique, Paris chez Masson, 1855," in which he strongly advocated palpation, "*le palper*," "*la palpation*," as a diagnostic and therapeutic agent in obstetrics, and advised external cephalic version, which he, however, wished called "*réduction céphalique*," in all breech and shoulder presentations during the last fortnight of pregnancy. He considered breech presentations as not physiological, and consequently wished them changed to head presentations during gestation, the operation, if necessary, to be repeated at the commencement of labor, when, in ease of need, the membranes may be ruptured to fix the head.¹

Herrgott, of Strassburg,² translated the above-mentioned paper of Wigand and indorsed his and Mattei's views. Esterle of Trent,³ however, published a paper proving that the latter author had overestimated the value of early version by external manipulation, for among 500 women who were examined by external manipulation during the seventh and eighth months of pregnancy, there were found 22 transverse positions of the fetus in utero; of those, 9 rectified themselves spontaneously, 10 were changed by external, and 2 by combined internal and

¹ Gaz. méd. de Paris, 23, 1855.

² Gaz. méd. de Paris, 27 Juillet, 1856.

³ Annali universali di med. Milano, 1859.

external manipulations, and in 1 internal version alone was necessary.

In France, where the operation had already met with strong advocates in Velpeau (1835), Lécorché-Colombe (1836), Cazeaux, Stoltz, Gros, Labouvierie, and Réal, an article was published in 1863 by Nivert,¹ who likewise earnestly supported it.

In Germany, the operation was recommended by Carnis, Grenser, Martin,³ Spengler, Arneth, C. Braun,⁴ Hildebrandt, Hegar⁵ (who in conjunction with Mattei⁶ advised the conversion of every breech presentation into a head presentation, during the latter months of pregnancy, by external manipulation), Hecker,⁷ and others.

Two methods of bimanual cephalic version were described and recommended in Germany by Busch and d'Outrepont, and are known there by their names. Busch advised introducing the hand corresponding to the side on which the head is situated, seizing the latter with the palm and drawing it down toward the pelvic inlet, while the external hand elevates the breech. D'Outrepont introduced the opposite hand into the uterus, seized the thorax of the child between fingers and thumb, lifted it up and turned it head downwards, while the external hand pushed down the head. The former method is the least severe, the latter the most efficient; both are still occasionally used in suitable cases. The later methods of Wright and Hicks are merely improvements on these two in the direction of greater safety and range of applicability.

In England, Sir James Simpson had already taught the utility of placing one hand on the abdomen during version to steady the uterus for the hand within the organ, but Braxton Hicks⁸ first published a systematic account of a new plan of performing "bimanual version," which has since become known by his name, and which has been until recently very generally believed and stated by some authors⁹ to be identical with that practised and described by Dr. M. B. Wright, of

¹ De la version céphalique par man. externes. Gaz. des Hôpit., 1863, Nos. 47, 50, 51, 56. Mon. f. Gebritsk., Bd. XXII., p. 152.

² Gynäkologie, 1831.

³ Beit. z. Gyn., H. 2, Jena, 1849. Mon. f. Geb., Bd. XVI., p. 1.

⁴ Allg. Wiener med. Ztg., 1862, No. 65. ⁵ Klinik d. Geb., II., p. 141.

⁶ Deutsche Klinik, 1866, No. 33.

⁷ Lancet, July 14th and 21st, 1860.

⁸ Loc. cit.

⁹ See, for instance, Richardson, l. c.

Cincinnati, six years previously. According to a recent open correspondence on the subject,¹ however, between Drs. Hicks and Wright, the question of priority does not come into play at all in the matter, for the two methods appear to be totally different in principle and practice, although both striving to attain the same end, the conversion of a transverse into a cephalic presentation. Dr. Wright's method, as stated by himself, consists in passing the hand corresponding to the side where the head is located into the vagina, and the fingers and thumb through the cervix ; while the external hand grasps the breech and pushes it towards the centre of the uterine cavity, the internal fingers press up the presenting shoulder, the thumb being in the axilla, and propel it laterally in an opposite direction to that taken by the breech. The head then, without being directly acted upon, glides into the superior strait, where, of course, it must be retained by proper means.

Dr. Hicks' method differs herefrom essentially, in that only one or two fingers are passed into the os, by which the presenting part is lifted and gently moved away from the superior strait, while the external hand presses and guides the head into the brim.

In both methods, combined external and internal version is employed, with the difference, as Dr. Wright very correctly says (*l. c.*), that "the force used to change the position of the fetus is *in opposite directions*. The outside hand is used by Dr. Hicks to *push down the head*—by Dr. Wright to *push up the breech*."

Wright's plan combines the good features of the methods of Busch and d'Outrepont, and while more effective, is doubtless also more severe than that of Hicks.

In the latest (but one) English work on midwifery, by Leishman (October, 1875), not one word is said of the possibility of recognizing the fetal positions or presentations by external examination or abdominal palpation, which is only mentioned as a means of detecting or causing active movements of the child, if the palpation be carefully performed. The eye, we are told, will often observe distinct projections or distortions of the abdomen, corresponding to the subjacent portions of the fetal body, but that we may ascertain the exact presentation by a

¹ Hicks, AM. J. OBST., V., 4, 1873; Wright, *ibid.*, VI., 1, 1873.

few touches of the fingers to the abdomen does not appear to be known to Dr. Leishman. Wigand's method of external version is referred to by Dr. L. (l. c., p. 495) as an operation "the directions for which include elaborate but, we fear, impracticable instructions as to the manner in which we should proceed," and which was never intended by Wigand to produce more than partial version. In conjunction with Braxton Hicks' (or rather Robert Lee's¹) plan of introducing two fingers into the partly dilated cervix and gradually pushing along the presenting part until the feet or head are within reach, Wigand's external version is spoken of as very efficient, and a long and very good description of the operation, now known as Braxton Hicks' *bimanual* or *bipolar version*, is given in Hicks' own words.

In Playfair's recent work, the last and probably the best English text-book on obstetrics (March, 1878), we finally find three-quarters of a page devoted to the "detection of fetal position by abdominal palpation," the facility of which, Playfair says, has not been generally appreciated in obstetric works, although by a little practice easy to make out. Playfair also gives the only diagram illustrating the procedure, which I have reproduced (slightly modified) in Fig. 1.²

Version by external manipulation is briefly but clearly described by Playfair, and is very properly restricted to the cases in which the membranes are still unruptured, the fetus is in the transverse position, and there is no immediate necessity for delivery. Dr. Hicks' bimanual operation is referred to at some length and illustrated by cuts, and the various other methods of ascertaining the presence and position of a fetus, and the errors to be avoided (fetal pulsations and movements, intermittent uterine contractions, uterine souffle, etc.), are described in sufficient detail.

It thus appears that up to the past year the main subject of my paper was not even alluded to in English works on obstet-

¹ See W. Tyler Smith's *Lectures on Obstetrics*, Am. Ed. 1858, p. 675, also Leishman, l. c.

² The fact that both Scanzoni and Schroeder have each given only a page and a half to diagnostic palpation alone, this being the longest account I have been able to find in any text-book, only shows that they considered this sufficient for the students of a country where the practice is daily taught on the living subject in all the medical schools. The reason why Playfair did not go more into detail and define and warn against the various difficulties attending the examination is probably to be sought in the limited scope of his epitome.

ries, and was even less known and appreciated in England than in this country.

In America, besides the eight papers already mentioned, by Wright, Noeggerath, Whittaker, Drury, Richardson, Chadwick, and Wilson, nothing has, to my knowledge, been written on the subject. So far as I have been able to learn, external version is briefly referred to in obstetrical lectures as being within the range of possibility, but is scarcely ever advised or discussed in a scientific manner.

Dr. Fordyce Barker informed me that he has for years devoted one lecture of each course at Bellevue to the description of obstetric diagnosis by external examination, illustrating the *modus operandi* on a patient in the amphitheatre; so also does he casually refer to the feasibility of external version, and employs both procedures whenever applicable in private practice. Dr. T. Gaillard Thomas and Dr. Wm. T. Lusk both expressed themselves in a precisely similar manner as regards their obstetric lectures at the College of Physicians and Surgeons and Bellevue Hospital respectively, and all three gentlemen agreed in saying that they thought the details of obstetric diagnosis, by palpation especially, would be new to the majority of physicians in the land, not only of general practitioners, but even of busy obstetricians, as they certainly must be to those men who had learned the practice only from the theoretical lectures attended by them in this country; a paper, therefore, containing these details could not fail to excite interest and prove valuable. As I had supposed, the opportunity to become practically acquainted with the method was at no time offered the student.

As I have thus far shown how little my subject is discussed in the text-books, I may say in the words of Holst,¹ when justifying an article on bimannual examination, which subject is neglected in the books, that "a detailed discussion of this method of examination is necessary to the completeness of a text-book, and information and counsel are subsequently sought in this particular branch by those who did not learn to examine in the clinic." Therefore, a paper like this, supplying, as it is designed to do, the deficiencies in the text-books, fulfills an indication doubtless apparent to many, and offers an,

¹ Beiträge zur Gyn. u. Geb., 1867, p. 2.

of course always imperfect, substitute for formerly neglected clinical instruction.

External manipulations for other purposes than for that of version were not known or advised until within the last fifty years, with the exception of the *expression of the placenta*, which was recommended and taught by Harvey and Hunter, and mentioned by Johnson in his "New System of Midwifery," 1769, "if performed on the outside of the abdomen, as equal to pressure on the uterus." Within a few years, Credé, of Leipzig,¹ devised and described an improvement on the old method of expression, which is now known by his name, and was seconded by Spiegelberg,² Winckel,³ Schüle,⁴ Künecke,⁵ Chantreuil,⁶ and is now generally adopted by all German physicians, and all foreigners who have profited by the teachings of the obstetricians of that country.

The *expression of the fetus* by means of manual pressure on the uterus through the abdominal parietes in cases of tedious labor owing to deficient uterine contractions was advocated at different periods during the last twenty years by Ritgen, Barnes, Kristeller,⁷ Playfair,⁸ and others, but has not been able to find its way into the esteem of the profession.⁹

The *expression of the head of the fetus during the extraction in footling presentations*, by means of pressure through the abdominal walls, was already recommended by Celsus (in the time of Augustus), again by A. Paré (1560), Pugh (1753), Wigand (1800), has in our time found warm supporters in Spiegelberg, C. Braun, Martin, and Fluck, and quite recently in Goodell (A.M. JOUR. OBST., Aug., 1875, and Trans. Phila. Obst. Soc., AM. JOUR. OBST., Feb. and June, 1876), particularly after version in contracted pelvis, and is a manipulation of the most decided utility which often enables us to save the life of the child.

¹ Klin. Vortr. über Geb., 1853, p. 599, and M. f. G., B. 16, p. 337, p. 345, B. 17, p. 274, and B. 22, p. 310.

² Würzb. Med. Z., II., 1861, p. 39.

³ M. f. Geb., B. 21, p. 365.

⁴ M. f. Geb., B. 22, p. 15.

⁵ Schuckardt's Zeitschr. f. prakt. Heilk., 1866, p. 417.

⁶ Arch. gén. de Méd. and Am. J. of OBST., IV., p. 334.

⁷ Berl. kl. W., 1867, No. 6, and M. f. Geb., B. 29, p. 337.

⁸ Lancet, 1870, Vol. II., p. 465.

⁹ This operation is mentioned already by Albucasis, Rodericus a Castro (1594), Jacob Rüff (1554), Ambroise Paré, and Johann von Hoorn.

Auscultation for the purpose of diagnostinating the existence of pregnancy and the position of the child was first employed by Mayer,¹ who in 1818 discovered the pulsations of the fetal heart, but the real practical utility of this sign was not understood until Lejunneau de Kergaradec,² in 1822, fully demonstrated its value, and also discovered the placental or uterine murmur, the origin of which he attributed to the rushing of the blood in the placenta. Ritgen³ denied the placental origin of the murmur and believed it to be caused by the blood coursing through the tortuous uterine vesseis, both veins and arteries, a theory now generally adopted, notwithstanding the supposition of Kiwisch (1851) that it originated in the external epigastric arteries on account of their course being more tortuous and angular during gestation, or in the iliac arteries, which are more or less compressed by the pregnant uterus.

Bouillaud, in 1836 (and again in 1876), advanced a view supporting in a measure that of Kiwisch, namely, that the placental souffle is produced by the compression of the intra-pelvic arteries by the pregnant uterus. On the other hand, the majority of contemporaneous French authors locate the bruit entirely in the uterus; Laennec in the chief nutrient artery of the placenta; Dubois (1831) believed that it arises from the direct passage of the arterial blood into the dilated spaces of the venous system within the uterine walls; Depaul⁴ claimed (and still claims in 1876) that the souffle is produced in the large arteries which supply the pregnant uterus and are most developed in the neighborhood of the placenta. An entirely novel origin for the uterine souffle has lately been discovered by Glénard (August, 1876), to which I shall refer in detail hereafter. Among German authors, d'Outrepont,⁵ with his pupils Ulsamer⁶ and Haus,⁷ Carns and Busch (who first mentioned the new discovery in their text-books), and in

¹ Bibl. univ. des sciences, Tome IX., Geneva, 1818.

² Mémoire sur l'auscult. de la grossesse, Paris, 1822.

³ Mende's Beob. u. Bemerk. aus der Geb., Göttingen, 1825.

⁴ Traité théor. et prat. de l'auscult. obst., Paris, 1847.

⁵ Gemeins. Deutsche Zeitschr. f. Geb., 1832, VII., p. 21.

⁶ Rhein. Jahrb. f. Med. u. Chir., VII., p. 50

⁷ Die Auscultation in Bezug auf Schwangerschaft, Würzburg, 1823.

later years Hohl, Naegele,¹ Hüter,² and Frankenhäuser³ investigated and followed up the subject of obstetric auscultation, to which Dubois, Depaul,⁴ Stoltz, in France, and Nagle, Fergusson, and Kennedy,⁵ in England, also paid special attention.

At present it is familiar to and practised by every educated accoucheur, although there are still some points, such as the detection of the sex of the child from the relative frequency of the cardiac pulsations, and the influence of some forms of dystocia on the rhythm of the fetal heart, which are yet open to discussion. The observations of Steele, Strong, Cummins, Underhill, Naylor, Parvin, and others on these subjects will be discussed under their respective headings.

The quantity of literature given above, although slight in comparison with what may be found on many other not more important questions, is still large enough to show the amount of attention and thought which has been devoted to the subject of external examination and manipulation by many prominent men in the profession, and consequently to demonstrate practically its value and importance, which is fully appreciated by all German obstetricians. The practice is, therefore, taught in all the German medical schools before, and on account of the greater readiness with which the women submit to it, almost in preference to internal examination. It is for this reason that German students are generally very familiar with the external examination of a pregnant woman, even though they be somewhat deficient in the frequently more difficult process of indagation. In Germany, no physician in private or hospital practice would think of giving a definite opinion on an obstetrical case, either with reference to diagnosis, prognosis, or treatment, without having controlled the results of his exploration per vaginam by the external palpation, inspection, and auscultation of the abdomen; in lying-in hospitals, indeed, every woman who applies for admission, no matter at what time of pregnancy, is by rule subjected to a thorough external and internal examination.

¹ Die geburtsh. Auscultation, Mainz, 1838.

² M. f. Geb., B. 18, Suppl., p. 23.

³ M. f. Geb., B. 14, p. 161.

⁴ Traité théor. et prat. de l'auscult. obst., Paris, 1847.

⁵ Obs. on Obst. Ause., Dublin, 1833.

That the position of the child can be ascertained with much greater certainty and often only in this manner, that errors in diagnosis and treatment are much more easily avoided, and particular abnormal conditions detected with greater facility by external manipulation than by internal examination alone, are facts which no one who has had sufficient opportunity to practise the procedure will attempt to deny, and which ought in themselves to be reason enough for the general adoption and employment of this method. Schröder¹ says: *For a less practised observer, unless the conditions be exceedingly unfavorable, the determination of the fetal presentation by external examination allows of much less room for error than if undertaken by internal exploration alone*, and the former should never be omitted, because it gives us an excellent control of the results obtained by indagation." By using all available means of making a correct diagnosis and detecting whatever may be injurious, we are not only doing our duty as physicians to our patients, whom it is our first and chief object to assist and benefit, even, if necessary, at the cost of slight personal inconvenience on either side, but we are also conforming to the present requirements of our profession in examining every case before us in the most thorough and scientific manner possible.

An objection which I have heard made in this country to the universal introduction of external examination in obstetric cases is that private patients, particularly those in the higher walks of life, will not submit to it on the ground of its being an improper and unnecessary exposure of the person, and that it is therefore likely to be restricted to hospital and poor practice. I do not think that any woman who has sufficient confidence in a physician to intrust to him her life during confinement will object to his palpating and auscultating her abdomen after submitting to a vaginal examination, when she is told that the one method of examination is as necessary to the safety of herself and child during the coming or already present ordeal as the other. I quite agree with Dr. Wilson when he says (*l. c.*) that he has never had a patient refuse when the necessity for the examination and the information to be gained by it had been explained to her, and that, instead of

¹ Loc. cit., p. 112.

lowering the physician in her estimation, it will tend to inspire her with confidence and convince her that he thoroughly understands his business.

I think further that, if our private patients were once initiated into the benefits of this practice and the very slight inconvenience occasioned them by it, and if our older physicians would make it a rule to insist upon it in every case (and they often are but little less able to dispense with it than their younger confrères), it would soon become a universal custom, as much desired by patient as by physician. Then we will see our patients calling upon us of their own accord during the last few weeks of pregnancy to demand, for their own satisfaction, an examination which now we frequently can obtain only after long persuasion; and it will become customary among the women of the poorer classes to insure themselves against accident during childbirth by seeking the same information at the clinics and dispensaries. How many malpresentations could thus be detected and corrected, how many dangers averted, how many women forewarned! Scarcely one of us but has met with obstetric cases in which a previous examination, before labor, would have enabled him to remedy a difficulty or prepare for an unforeseen accident.

External obstetric examination and manipulation admits of division into two great chapters, accordingly as the procedure is adopted for the purpose of *diagnosis* or of *treatment*.

I.

DIAGNOSIS.

For the purpose of *diagnosis* we distinguish several practical subdivisions of the procedure, each of which in a measure controls and supplements the others, and which all together tend to give certainty to the examination.

These are: *Inspection*, *Palpation*, *Percussion*, and *Auscultation* of the abdomen, and shall each be treated of separately.

The proper period for making the examination is at any time during the last month of gestation, in order that malpresentations and any abnormal conditions may be detected and corrected previous to the actual inception of labor, or at

least suitable preparations made to meet the probable difficulty. It is also the first duty of the physician, as soon as he is called to an obstetric case, even before he makes the controlling vaginal exploration, to practise external examination.

Position of the woman.

The woman to be examined invariably occupies a recumbent position on her back, with slightly elevated head and with her thighs drawn up, in order to relax the abdominal muscles. If she voluntarily contracts her muscles, as is often the case from apprehension or reflex irritation by the examining fingers, she should be told to open her mouth and take deep in- and expirations, when during the latter her muscles will be found perfectly relaxed. Corsets and drawers should be removed, all constricting bands about the waist loosened, and the abdomen entirely exposed. The lower extremities are covered by a sheet, which may also extend over the abdomen, or the chemise may be drawn down (not during inspection of course), but it should be borne in mind that any covering, however light, interferes with the facility, delicacy, and accuracy of the examination.

The bladder and rectum should be in an empty condition, and if necessary must be evacuated immediately prior to the exploration.

A.—INSPECTION.

The ocular examination of the abdomen of a pregnant woman gives us a variety of diagnostic signs, such as the size and shape of the abdomen, the appearance of the skin, particularly of the linea alba, the presence or absence and the appearance of cutaneous striæ, the form of the umbilicus, and frequently also the visible motions of the fetus.

As regards the size and shape of the abdomen, a somewhat practised eye can form an approximate estimate of the probable stage of pregnancy and perhaps also the position (not presentation) of the fetus in utero; for, as a rule, we find the abdomen in longitudinal positions to be long, narrow, and oval, whereas in transverse positions it is broad and more distended at its base and less so above the umbilicus, which latter peculiarity might also lead to the diagnosis of twins, especially if there be a longitudinal furrow in the median line, and each

half of the abdomen be equally distended. This longitudinal furrow, or an apparent division of the abdomen into two halves, may be simulated by a distended bladder or arise from a peculiar formation of the fundus uteri (*uterus arcuatus*) and is therefore of but little value in the diagnosis of the fetal position or plurality. The size and shape of the abdómen can be just as well ascertained by palpation, and is, moreover, subject to so many variations that no conclusive deduction whatever should be made therefrom.

The skin of the abdomen may be perfectly white and smooth, but generally it shows numerous red or white shiny lines or *striæ*, which arise from its distention during pregnancy, and are owing to the rupture of the deeper layer of the epidermis, the *rete mucosum* or *Malpighi*, the red *striæ* being of recent origin and occurring principally with primigravidæ, and the white marks being the evidence of former pregnancy and having already undergone the process of cicatrization, an explanation first given by Credé.¹ These lacerations of the *rete Malpighi* could, of course, only indicate a first pregnancy, as the old cicatrices do not disappear in the course of time, but the fact of their being frequently seen in cases of distention of the skin by tumors, ascites, and even simply from obesity, and their being not unfrequently wanting, even in multigravidæ, makes them of but secondary importance in the diagnosis of pregnancy.

According to Hecker and Buhl,² these *striæ* are wanting in 6 per cent of all cases; in 11 per cent of primigravidæ, in 5 per cent of multigravidæ. They are found also on the nates and thighs, as well as mammae, and Schultze³ saw them on the thighs of women who had borne no children in 36 per cent, and in men in 6 per cent. He explains this fact by the greater increase in the breadth of the hips in the female sex at puberty.

The linea alba ordinarily assumes a dark color during the first pregnancy, especially in brunette women, and retains this pigmentation generally in after-life, so that it can only be considered a diagnostic sign with the first child.

¹ Mon. f. Geb., 1858.

² Klinik d. Geb., Leipzig, 1861.

³ Jenaische Z. f. Med. u. Nat., 4. Band, 3. u. 4. Heft, 1868, p. 577.

The umbilicus becomes gradually flatter and less depressed during the last five months of pregnancy, and occasionally even protrudes above the surrounding skin, without, however, being at all characteristic of pregnancy, inasmuch as any considerable distention of the abdomen may produce the same result. Should the abdominal walls not be too thick or rigid, we can often see sudden protrusions of certain parts, and rapid twitchings over the abdominal surface, arising from the motions of the child and its close contiguity to the intrauterine surface. I have repeatedly observed the fetal head in breech or transverse presentations distinctly recognizable by sight through the thin abdominal and uterine walls, and the smaller parts, arms and legs, can be recognized at times in almost every case. It must be borne in mind, however, for the avoidance of error, that such twitchings may be simulated, even at will, by contractions of the abdominal muscles and the peristaltic motions of the intestines.

Dr. Ludwig Bandl, of Vienna, has recently¹ pointed out a phenomenon recognizable by inspection of the abdomen during labor only, which is of considerable practical importance. He found that, in those cases where there exists an abnormal obstacle to the expulsion of the child, such as contracted pelvis, malposition of the child, etc., a distinct transverse furrow appears on the abdomen, about midway between the umbilicus and pubes, just at the junction of the cervix and body of the uterus. This furrow is produced by the wedging in of the cervix into the brim of the pelvis by the presenting part, and the concomitant fruitless concentric contractions of the uterine body. It occurs only in abnormal labors, and affords a valuable indication as to the time and necessity for operative interference, for obviously the undue continuation of this condition would very readily result in the production of a rupture of the uterus. Indeed, Bandl first witnessed this sign after such an accident. In normal labors, the presenting part passes into the pelvic cavity and fills out the cervical canal equally, thus preventing the occurrence of a transverse furrow. I have seen this furrow in several cases where there was excessive pelvic obliquity and consequent anteversion of the uterus, a condition simulating

¹ Trans. Germ. Med. Assoc., 1875. Arch. f. Gyn., VIII., 3.

in its influence on the progress of labor the minor degrees of contracted pelvis.

B.—PALPATION.

By gently and firmly pressing the palmar surfaces (not the tips only) of all the fingers of both hands into the abdominal parietes and gradually moving them over the surface of the abdomen with the least possible irritation, we are able, in the majority of instances, to detect with absolute certainty the shape and consistence of the uterus, period of pregnancy as shown by the size, the amount of the liquor amnii, the position, approximate size, life, and greater or lesser degree of mobility of the child, its different members, the presence of more than one

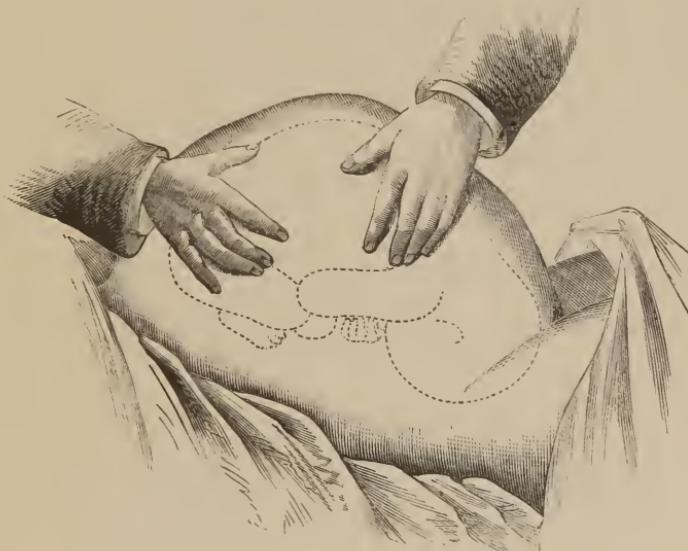


FIG. 1.

fetus, the fulness of the urinary bladder, and finally any abnormal condition which may be present, such as tumors and malpositions of the uterus, diastasis of the recti muscles, ascites, etc.

Method of Palpation.—1st. The physician, having warmed his hands, stands on the right of the patient and gently places them on her bare abdomen, moving them slowly about with

a slight pressing, "pawing" motion, keeping them sometimes close together, at others separated, now examining only one spot, then endeavoring to bring the uterus and its contents between the two hands. With the hands kept nearly flat on the abdomen, the shape, consistence, inequalities, and general configuration of the uterus are ascertained step by step; the facility of this exploration being modified by the greater or lesser amount of abdominal adipose tissue, the thickness of which can be determined by pinching up a fold of the integument between the forefinger and thumb. 2d. The second step is to ascertain the *period of gestation*, which is done by slowly passing the tips of the fingers towards the upper part of the abdomen, gently pressing them in until resistance ceases, and the fingers can be pressed in more or less deeply towards the spinal column, when the fundus can usually be grasped and felt as a rounded, firm, convex surface. By pressing the ulnar or radial edge of the hand, as the case may be, deep into the abdominal wall at the point where the fundus ceases, and laying the hand flat on the integument, the number of finger-breadths which the fundus is situated above the symphysis or umbilicus, or below the ensiform process or umbilicus, is easily determined, and consequently also the approximate period of the pregnancy (as will be shown hereafter). 3d. This having been ascertained, the hands, moving along side by side, seek the palpable parts of the fetus—the *head* or *breech*, the *knees* and *feet* (the *arms*, being folded on the thorax, are scarcely ever accessible to the external touch), and the *back*, and by gently pressing, perhaps slightly displacing them, determine their character. 4th. The *presenting part* is detected by grasping the hypogastric or suprapubic region with the whole hand, four fingers being on one side and the thumb on the other (Fig. 2), or by placing one's self by the side of the woman with one's back towards her head, putting one hand with the fingers downwards on each of the inguinal regions, and attempting to make the finger points meet in the median line (Fig. 3); the presenting part will thus be firmly grasped between the fingers and thumb, or between both hands, and its character, whether head or breech, generally easily determined.

5th. To detect the *mobility of the fetal parts*, the tips of the fingers are gently placed on the abdominal integument, and

then quickly and suddenly thrust inwards against the subjacent parts, which, if extremities, will be withdrawn ; if head or breech,

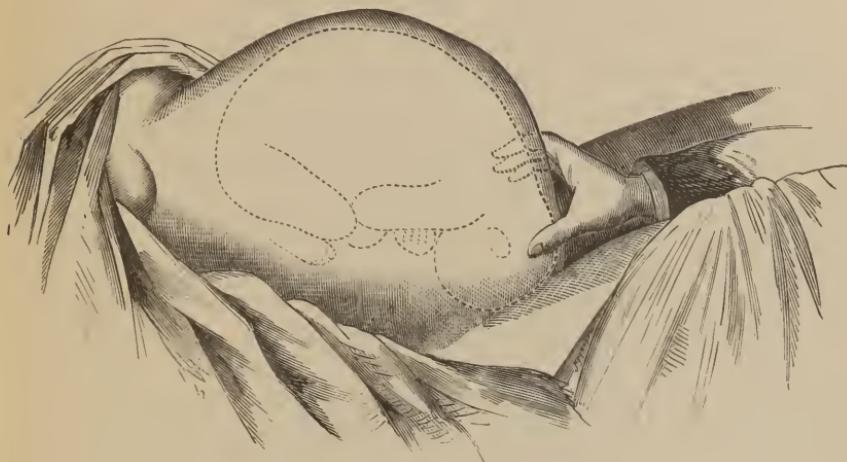


FIG. 2.

will recede and rebound against the exploring fingers (*ballottement*). The motion of external ballottement is rather a shove

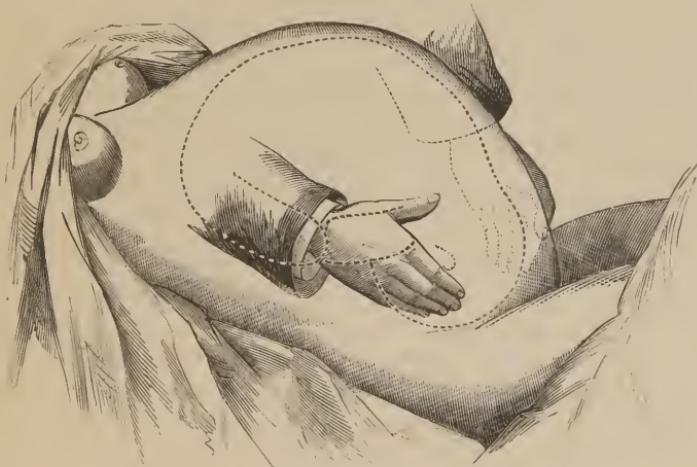


FIG. 3.

than a blow and is best executed by an action from the elbow, the wrist and hand being stiff and but slightly flexed.

It is hardly possible to explain every minute technicality of the manual of external examination, for it is best learned by practice; the above description is sufficiently explicit to enable any one, with the assistance of time and careful attention to the special points to be referred to hereafter, to examine a pregnant woman by this method with a fair prospect of making an accurate diagnosis. One point must be remembered, and that is, that no force whatever need be employed in any part of the examination, and that the woman should be subjected to no real discomfort or pain; indeed, forcible or promiscuous manipulation will in itself frustrate the object of the procedure, by exciting reflex contractions of the abdominal and uterine muscles, and thus withdrawing the fetus from the touch of the examiner.

PERIOD OF PREGNANCY.—The size and shape of the uterus, particularly the former, are liable to vary greatly at the same stage of gestation in different persons, according to the size of the child and the quantity of amniotic fluid.

If we divide the normal period of gestation, 280 days, reckoning from the commencement of the last menstruation, into ten lunar months of 28 days each, we find the following conditions during each of the ten months:

1st and 2d months.—The uterus is still in the cavity of the pelvis and not palpable.

3d and 4th months.—During the third month the fundus uteri gradually rises above the brim of the pelvis, especially if there be contraction of the latter, and in very emaciated persons becomes accessible to palpation. Ordinarily the uterus is not palpable until towards the end of the fourth month, when it may be felt about midway between the symphysis pubis and the umbilicus (four fingers' breadth above the symphysis) as a rounded, elastic body with a tolerably even surface. Ballottement may occasionally be felt.

5th month.—The fundus gradually rises, and at the end of this month is to be felt about one finger's breadth below the umbilicus, generally slightly to the right of the median line; in lean persons the voluntary motions and the several parts of the fetus can frequently be detected by the hand, and ballottement is not unfrequently felt.

6th month.—The fundus uteri is palpable about one finger's breadth above the umbilicus, the fetal parts become more dis-

tinct, especially in multiparæ, ballottement is usual, and the presentation can ordinarily be made out without much difficulty. The surface of the uterus becomes more irregular, in accordance with the increased size and strength of the child, and the consequent protrusion of the uterine walls by its members. The fetal heart-sounds, which are occasionally faintly heard at the end of the fifth month, have now become perfectly distinct to a practised ear.

7th month.—Fundus uteri three fingers' breadth above the umbilicus, distinctly inclining towards the right side. The circumference of the abdomen at the umbilicus is 91 cm. ; midway between umbilicus and symphysis, 94 cm. ; from the ensiform process to the symphysis, about 42 cm. The umbilicus is flat ; the fetal parts become more and more distinct.

8th month.—Fundus midway between umbilicus and ensiform process, 4-5" above the former, and slightly towards the right side (Scanzoni) ; circumference of abdomen at height of umbilicus averages 95 cm. ; between navel and symphysis, 97 cm. ; distance between ensiform process and symphysis, 43.5 cm. (Schroeder). The umbilical fossa is entirely obliterated. In primigravidæ the head is situated more in the median line, in multigravidæ it is frequently found slightly to one side or the other. The fetal parts during the last two months have gradually become more easily palpable ; the fetus has lost its extreme mobility, although the breech and head still readily respond to the motion of ballottement.

9th month.—Fundus immediately below the ensiform process, having reached its highest point. Distance between ensiform process and symphysis, fully 44 cm. ; circumference at umbilicus, 97.5 cm. ; below, 99 cm. Umbilicus protrudes (Schroeder). The fetus closely touches the uterine walls, the surface of the uterus is consequently less impressible. That part of the uterus and abdomen in which the breech lies generally protrudes, thus destroying the spherical shape of the fundus.

10th month.—During the first half of this month, the uterus still increases in size, and not being able to extend any higher in a vertical direction, expands laterally under the false ribs, particularly on the right side ; the integument of the precordial region is then often so tight as to prevent the palpation of

the fundus. The circumference at the umbilicus is 99 cm. ; below it, 100 cm. ; the distance from ensiform process to symphysis, 45.5 cm. (Schroeder). During the last two weeks of gestation the lower segment of the uterus, and with it the presenting part of the fetus, descend often quite suddenly into the grasp of the superior strait of the pelvis and become more or less firmly fixed there ; consequently the fundus leaves the precordial region and becomes palpable again about midway between the umbilicus and the ensiform process, nearly where it was at the end of the 8th month, generally slightly higher than at that period ; it has fallen forward in its descent, and the change in the appearance of the abdomen is perceptible even to the casual observer.

Scanzoni, Schroeder, Playfair, and indeed most writers on obstetrics agree in their description of the descent of the uterus during the two closing weeks of gestation.

It is evident that this old method of measuring the height of the fundus uteri as so many finger breadths above or below the umbilicus must be an exceedingly uncertain one, because the length between the umbilicus and symphysis pubis varies greatly in different individuals. As the most ready, convenient, and ordinarily sufficiently definite plan, I have, however, described it above ; but I still must agree with Sutugin¹ when he expresses his surprise that careful teachers like Hildebrandt and Schroeder should still advise this method of examination. Ahlfeld,² and four years after him Vassily Sutugin, have both measured the height of the fundus uteri from the upper border of the symphysis pubis with tape-measure and pelvimeter (which latter instrument is much the more reliable), and have constructed tables of the average height which differ but very slightly and are positively trustworthy.

They both arrive at the conclusion that the height of the fundus uteri above the pubes is a reliable objective symptom of various periods of pregnancy in normal and reducible oblique presentations, when the womb contains only one fetus. In

¹ Vassily Sutugin : On the Means of Ascertaining the Length of Gestation by Measurements of the Fetus and gravid Uterus during the Second Period of Pregnancy. Trans. Lond. Obst. Soc. Obst. J. Gr. Br., Sept., '75.

² Arch. f. Gynäkologie, Band II., Heft 3, 1871. Bestimmungen der Grösse und des Alters der Frucht.

plural pregnancy, non-reducible, oblique, and transverse presentations, the height of the uterus cannot be used to indicate the period of pregnancy.

Contrary to the universally accepted opinion, Ahlfeld, Sutugin, and Richelot¹ decide that the fundus uteri keeps ascending to the very end of pregnancy, and that there is no descent of the fundus during the tenth month; this rule is applicable to every case individually, whether primipara or multipara, provided the patient be placed during examination in a horizontal position. As a rule, on the patient assuming the erect posture, the measurements show, however, that during the last month of pregnancy the fundus uteri stands two finger breadths lower than during the preceding month. The difference in height of the fundus in primiparæ and multiparæ is almost inappreciable; as regards breadth, however, in the multiparæ the womb is somewhat broader, commencing with the thirty-fourth week of pregnancy. This is also the case in breech presentations, in which the height, however, is 3 centimetres greater than in head presentations.

The average height of the fundus uteri and the average breadth of the uterus were found by Sutugin to be, in the

	AVER. HEIGHT.	AVER. BREADTH.
21st week	19.0 cm.	14.0 cm.
22d "	19.0 "	15.0 "
23d "	19.0 "	15.5 "
24th "	19.0 "	15.5 "
25th "	21.0 "	16.5 "
26th "	21.0 "	15.5 "
27th "	19.0 "	16.0 "
28th "	20.1 "	16.8 "
29th "	21.5 "	17.1 "
30th "	22.4 "	17.4 "
31st "	21.9 "	17.9 "
32d "	22.0 "	18.3 "
33d "	22.1 "	19.1 "
34th "	23.2 "	18.9 "
35th "	23.8 "	19.6 "
36th "	24.0 "	19.8 "
37th "	24.15 "	19.8 "

¹ Richelot: Zur Diagnostik der Schwangerschaft. Inaug. Diss., Königsberg, 1868.

	AVER. HEIGHT.	AVER. BREADTH.
38th week.....	24.5 cm.....	20.4 cm.
39th " "	24.9 "	20.4 "
40th " "	25.4 "	20.4 "

In the erect posture the average height of the fundus was 22.5 cm. in the 40th week, 23.3 em. in the 39th, 23.4 cm. in the 38th, 23.3 cm. in the 37th, 22.5 em. in the 36th, 22 cm. in the 35th week.

It is scarcely necessary to say, after the above remarks, that instrumental measurement of the dimensions of the abdomen is greatly to be preferred to a mere manual estimate.

Although these measurements will generally be found accurate in determining the period of gestation, they do not, as already stated by Sutugin, hold good when the fetus occupies a transverse position, by which, of course, the vertical diameter of the uterus is shortened; nor always in case of twins, with which the transverse diameter also becomes disproportionately large, nor in case of contraction of the pelvic brim, by which the presenting part is prevented from descending during the last fortnight of gestation, and consequently the usual descent of the fundus also does not take place; nor in case of fulness of the bladder or rectum, by which the uterus is likewise prevented from sinking to its proper level in the pelvis. Deformities of the vertebral column or thorax, tumors of the uterus, ovaries, or pelvis, and hydramnios, may further influence the correctness of the above data.

Of course, the result of the external examination should always be controlled, and may frequently be modified, by a vaginal exploration.

According to measurements made by Hecker,¹ which agree generally with those already quoted from Schroeder, the *size of the abdomen in pregnancy*, as mentioned before, is extremely variable; in 112 cases he found that the abdomen increases in circumference steadily until confinement, in the tenth month 3 to 4 cm., in the ninth and tenth months 7 to 8 cm. The circumference measured in the ninth month 89 to 112 cm.; in the tenth month, 88 to 116 cm.; and during labor, 90 to 116 cm. The average in the tenth month was: for primigravidæ, 97 cm.; for multigravidæ, 100 cm.

¹ Hecker and Buhl, loc. cit.

The *tension and firmness of the abdominal walls* does not necessarily diminish with the increasing number of pregnancies, although it is undoubtedly more common to find the abdominal and uterine parietes more flabby, pendulous, and impessible in multiparae (the more, the greater the number of children) than in primiparae. The increased circumference of the abdomen in the former, mentioned by Hecker, probably depends partly on this cause and partly on the increase of abdominal adipose tissue so commonly found in women as they advance in age. During the first four months, the uterine walls are firm and tense, with the increase of liquor amnii, however, they become thinner, more impessible and pliant, until the filling out of the uterine cavity by the growth of the child and its consequently diminished mobility again renders them less yielding to the touch.

The *uterus* is easily recognized by the touch as an elastic, regular body, rounded above and extending down into the pelvis. In the earlier months, so long as the fetus does not occupy any permanent position, its shape is more spherical, later, when the child assumes a fixed, generally longitudinal position, it conforms to the shape of its contents and becomes ovoid. The fundus uteri generally inclines slightly towards the right side of the abdomen, a phenomenon which has been variously explained, Madame Lachapelle supposing it to result from the right round ligament being shorter than the left, and E. Martin attributing it to the presence of organic muscular fibres in the round ligament. Seanzoni¹ gives the following explanation :

The uterus, increasing in size, pushes the intestines out of their normal position ; these latter retire where they have the most room, that is, to the left upper portion of the abdominal cavity, the right being occupied by the liver ; the uterus is thus obliged to take the only open space and incline towards the right side, pushing the abdominal wall before it.

Any abnormalities in the shape of the uterus or the presence of subperitoneal fibroid tumors are easily detected by palpation. I have several times observed a distinct depression of the fundus in the median line with a bulging out on both sides, which could be and doubtless was nothing else than the slightest degree of uterus bicornis (or uterus arcuatus according to

¹ Loc. cit.

Kussmaul¹) and is a remnant of the formation of the uterus from the two ducts of Müller.

An exceedingly slight concavity with a corresponding prominence of the two cornua is generally noticed during the contraction of the uterus in labor in these cases. Knowing, as we do, the various forms of dystocia which are liable to happen in exaggerated cases of this deformity, the detection of its presence is not without practical value as regards prognosis and treatment.

A valuable diagnostic sign of pregnancy has been pointed out by Braxton Hicks,² namely, the occurrence of regular intermittent contraction and relaxation of the uterus when that organ is firmly grasped by the hand through the abdominal walls, without friction or active pressure being used. This intermittent contraction occurs every five or ten minutes, or oftener, and Playfair says³ that he has never known it to fail or be absent when pregnancy existed. This sign has the advantage over the fetal movement that it is constant, not easily simulated by anything else, and that it occurs whether the uterus contains a living or a dead child. The history of the case will prevent its giving rise to errors in the case of the enlargement of the uterus by tumors or retained fluid, where this sign may also occur.

The chief object of palpation, the *diagnosis of the presence of a fetus and its position*, is seldom possible before the end of the fifth month, the quantity of liquor amnii, the diminutive size, and the pliability and mobility of the child, the tension and thickness of the uterine walls, rendering it very difficult to obtain a definite result which could perhaps only be arrived at by bimanual examination.

Before the seventh lunar month the quantity of amniotic fluid is so much out of proportion to the size of the fetus that the latter floats free in the uterine cavity, neither marring the symmetry of the uterine outline nor remaining long enough in contact with the uterine walls to allow of the distinct palpation of its individual members. From that time, however (exceptionally even during the sixth month), the several por-

¹ Von dem Mangel, Verkümmern und Verdoppelung der Gebärmutter. Würzburg, 1859.

² Obst. Trans., Vol. XIII.

³ L. c., p. 152.

tions of the fetal body become more and more distinct to the touch, and are recognized by the following characteristics:

The *head* is felt as a round, hard, exceedingly movable body (usually giving the bonnding sensation called ballottement), apparently floating about entirely free, on account of its flexible connection with the neck.

The *breech* is a larger, softer, more irregular, less movable tumor, the rebound of which is much slower and less vivid than that of the head.

The *back*, being the continuation of the breech, is detected by the uninterrupted, regular resistance offered to the palpating fingers (Scanzoni says that with very thin and flaccid abdominal walls he has several times been able to recognize the back by the spinous processes of the vertebræ; I have never met with such a case).

The *feet* and *legs* are recognized as very movable, often sharply projecting, small, irregular bodies, which are easily pushed about, and frequently retaliate by striking sharp blows to the examining hand.

The *arms* are not usually palpable, because they are kept in a crossed and flexed position on the thorax.

From the place which each of these different members occupies in the uterus, it is easy to diagnosticate the momentary situation of the child, which, however, frequently voluntarily changes its position. According to B. S. Schultze, Fassbender, and Hoening, the change of the fetal position in the seventh and eighth months takes place in 12.4 per cent of primigravidæ, and 23 per cent of multigravidæ, two-thirds of all the changes being from one head presentation to another.

Sutugin¹ finds that changes of position are quite common in plurigravidæ even at the end of pregnancy; in primigravidæ they are much more rare near term, but do still occur during the last week, and *even during actual labor itself*. The frequency of change of fetal position both in primigravidæ and plurigravidæ is nearly three times as frequent in contracted pelvis as in normal pelvis.

Contractions of the uterus and abdominal muscles exert considerable influence on the frequency of the change of position, and especially of the presentation, which, however, do not

¹ St. Petersburg Med. Ztg., 1875, V., 2.

appear to be affected by the sex and size of the fetus, and the size and age of the mother. The spontaneous movements of the fetus are easily detected by the examining hand, and serve to indicate, 1st, the undoubted presence and life of the child; 2d, the probable quantity of amniotic fluid, and 3d, the approximate size and strength of the child. If the child is strong and healthy, its motions will generally be quick and active, provided the amount of liquor amnii permits sufficient freedom; if the amniotic fluid is excessive in quantity, the fetal movement will be rapid, but weak and flighty, because, as a rule, the size of the fetus and the amount of liquor amnii are in inverse proportion.

The voluntary motions of the child are not always felt, because in some cases the uterus incloses its contents too firmly and there is too little fluid present, in others the fetus is weak, sickly, and incapable of active exertion; however, some mothers never feel quickening during their whole pregnancy, and still the children are born strong and healthy.

These voluntary fetal motions are of two kinds: 1, a slow, gliding, rolling motion, proceeding from the whole child, and 2, quick sharp knocks or blows which result from the action of its upper or lower extremities. These so-called *active* motions of the fetus are rarely felt or observed before the twentieth week of gestation. Only one instance do I find mentioned of their having been felt as early as the beginning of the fourth month, an extraordinary and precocious development of the child being the probable cause.¹ In addition to this spontaneous mobility, the examining physician can, in most cases, especially if the uterine and abdominal walls be thin and flaccid, the child small and the amniotic fluid abundant, press and push the child about in the uterus with greater or lesser facility, and thus cause the passive fetal motions, which sensation, together with the palpation of the different portions of the child, especially the head, and the general appearance of the abdomen, ought with some practice to give him at least an approximate idea of the probable *size of the fetus*. A more than approximate idea is very difficult to obtain, even with the assistance of a vaginal examination; although Prof. Carl Brann, of Vienna, with his immense experience, professes to be able to

¹ Cramoisy, L'abeille méd., 29, 1857.

diagnosticate the weight and length of the fetus in utero by means of external and internal examination, there are not very many practitioners who have sufficient experience to do the same, and I have seen Prof. Braun himself occasionally shoot pretty wide of the mark.

As an aid in this calculation and the diagnosis of the stage of pregnancy, as also for the benefit of prognosis and treatment, Ahlfeld, of Leipzig, has lately¹ published an account of a number of measurements which he made of the length of the uteruses (to which I have already referred in another connection), and therefrom he computed the length and consequently the weight of the child. Footing on several observations of his and others, that the length of the uterine axis of the fetus is about half the length of its whole body, he drew the natural inference that the length of the fetus would also be about double that of the uterus in which it lies, and therefore measured the length of the uterus, placing one branch of Baudelocqne's pelvimeter against the fetal head or breech in the vagina (or rather in that part of the uterus which projects into the vagina) and the other at the spot on the abdomen where the fundus uteri could be distinctly felt, and doubling the number obtained, the actual length of the child was ascertained. On an average he found, in 250 cases, that in the 36th week the child measured 48.3 centimetres in length, and weighed, the weight being computed by analogy, 2,806 grammes;² in the 37th week, 48.3 cm., and 2,878 grms.; in the 38th week, 49.9 cm., and 3,016 grms.; in the 39th week, 50.6 cm., and 3,321 grms.; and in the 40th week, 50.5 cm., and 3,168 grms. Transverse positions were measured in the same manner, the branches of the pelvimeter being placed transversely against breechi and head of the fetus in utero. Sutngin (l. c.) substantially agrees with Ahlfeld's measurements, and finds that the height of the base of the uterus is equal to one-half the length of the fetus. Although the practical value of this new procedure still needs the confirmation of time and experience, the facility and painlessness of its application recommend it for frequent trial in all cases where the prognosis or treat-

¹ L. c.

² 2.75. centimetres = about 1"; 30 grammes = $\frac{2}{3}$ i.; about 500 grammes = lb. i.

ment in a measure depend on the size of the child (premature delivery for habitual excessive development of the child at term, contracted pelvis, cancer of the cervix, etc.).

The spontaneous movements of the fetus are frequently excited or increased by the temporary application of cold to the abdomen, not in consequence of the direct transmission of the cold itself to the fetus, but through reflex action from the abdominal integument to the abdominal muscles, which contract and press on the uterus, which in its turn contracts and thereby incommodes the fetus, causing it to protest with hands and feet against the disturbance and to rapidly change its position. I have witnessed this phenomenon hundreds of times, when students, forgetting the rule to warm their hands before examining, proceeded to palpate the abdomen, and produced not only a slight shock to the mother (the avoidance of which heedlessness is not unimportant, especially in fashionable private practice), but also contractions of the uterus, thereby interfering with the examination. I am thus explicit in explaining this to me always simple phenomenon, because Dr. Chadwick (*loc. cit.*, p. 7) says that it is inconceivable that the cold itself should penetrate to the fetus and excite the unwonted activity; that it is "within the bounds of reason, though improbable," that the reflex nervous current thus excited could influence the uterus and indirectly the fetus, and that he has had "no opportunity of verifying the truth of this assertion as to the application of cold."

We all know how easy it is to excite uterine contractions by merely pressing the uterus through the abdominal walls, which is substantially the same action as that offered by me in explanation of the increased fetal movements after the momentary external application of cold. The observation of the contraction of the muscles of a part in consequence of an irritation of the skin of that same part is of too common, not only everyday, but every-minute, occurrence to need further comment.

A unique case in literature, in which the umbilical cord was detected, by inspection and palpation near term, on a level with the umbilicus, has recently been reported by E. Bidder.¹ The cord crossed the back of the fetus transversely and was easily movable, but could not be slipped over the breech.

¹ St. Petersburg Med. Wochensch., 1876.

It pulsated 152 times to the minute. At birth the cord was found to measure only 30 centimetres.

Dr. Paul Budin, of Paris, has recently¹ described a peculiar "ovarian pain" which he frequently observed during the palpation of pregnant and parturient women, chiefly on the left side, where he distinctly felt an oval transverse body corresponding in size and position to the ovary. Pressure on this body caused intense pain. The round ligament could also be felt. While I have frequently found one or the other ovarian region sensitive to pressure in pregnant and parturient women, I certainly do not recollect having ever detected the ovary by external palpation in that condition, and should scarcely expect to do so, except in a high degree of emaciation of the abdominal wall.

Position of the Child.

By *position of the child* I mean the relation of its longitudinal axis to that of the uterus; if both axes are parallel, the child occupies a longitudinal, if they cross each other, a transverse position.

By *presentation* I mean the relations which (the position, longitudinal or transverse, being fixed) certain parts of the child hold to certain portions of the uterus; thus, when the head is in the lower uterine segment, we have a head; when the breech occupies that situation, a breech; and when the thorax crosses the pelvic brim, a transverse (or thorax) presentation. Various subdivisions, according as the back of the child is turned towards one or the other portion of the uterus, are designated as first or second, being generally known by the name of the group to which they belong, viz., I. or II. vertex, face, breech, footling, or transverse presentation.

In order to avoid mistakes and unnecessary repetition, it may be well to introduce here a synopsis of the different positions and presentations as generally adopted in this country and abroad.

Positions: Longitudinal and transverse.

Longitudinal positions are divided into vertex and face, and into breech or foot presentations, each of which are again subdivided into first and second subpresentations.

¹ *Progrès Méd.*, 9, 1879.

Vertex or occipital presentations:

- I. Left occipito-anterior, L. O. A. Occiput and back turned towards the left side of the mother, right parietal bone presenting per vaginam.
- II. Right occipito-anterior, R. O. A. Occiput and back to the right side, left parietal bone presenting.

Face presentations:

- I. Left frontal; forehead and back to the left side, right cheek presenting.
- II. Right frontal; forehead and back to the right side, left cheek presenting.

Breech or footing presentations:

- I. Back to the left side, left hip presenting.
- II. Back to the right side, right hip presenting.

Transverse presentations:

- I. Dorso-anterior; back towards abdomen of mother. *1st subdivision*, head in left iliac fossa of mother, L. D. A. *2d subdivision*, head in right iliac fossa of mother, R. D. A.
- II. Dorso-posterior; back towards spinal column of mother. *1st and 2d subdivisions* as above, L. D. P. and R. D. P.

Various minor subdivisions, such as the III. and IV. antero-vertex, or occipito-posterior presentations (considered to be merely abnormal rotations or arrest of rotation of the two regular vertex presentations), frontal presentations (rare instances of arrested face-presentations, usually requiring forceps or craniotomy), and complete and incomplete foot and knee presentations, only call for brief mention. The third and fourth face and breech presentations (corresponding to vertex), I omit entirely from this classification, as they are mere steps in the mechanism and have no practical importance.

Longitudinal Positions.—The presence of a large round body in the upper portion of the uterus, as a rule, indicates that the long axis of the latter and that of the child correspond. Should the small parts be also found near the fundus, the probability always is in favor of a head presentation, inasmuch as the arms seldom leave their condition of flexion on the thorax and thus rarely become palpable. The usually easy detection of the hard round head above the symphysis pubis confirms the diagnosis, which would be changed to that of a breech presentation were this same hard body to be felt above the umbilicus.

Occasionally the presenting part is found resting on the iliac fossa, generally on the left side, because of the usual dextral inclination of the fundus, and is then easily movable, as is also the case when it occupies the pelvic inlet previous to the last few weeks before term; as soon as it has descended into the pelvis it becomes more or less fixed and thus serves to foreshadow the near approach of labor.

According to Sutugin,¹ the fetus lies during pregnancy with its back turned posteriorly and either to the right or left side. The back is found turned directly to the side of the mother only in the erect posture, and in the recumbent posture only if contractions have preceded the examination. In the early part of gestation, the position with the back to the right side

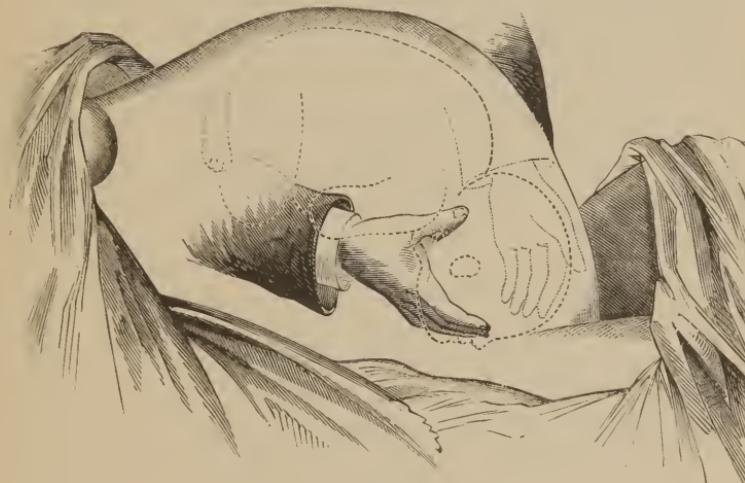


FIG. 4.

occurs more frequently than towards term; near the end of pregnancy, however, the back is found more commonly on the left side.

Not until the head has sunk to the floor of the pelvis during labor, does it withdraw from palpation, and the examining fingers will feel instead the softer and more slender neck. At this stage, however, diagnostic palpation of the presenting part gives way to indagation.

Until recently it was thought possible to detect a *face pre-*

¹St. Petersburg Med. Ztg., 1875, V., 2.

sentation only by internal examination, after the os was sufficiently dilated to permit the touching of the presenting part; in 1868, however, Prof. Breisky, of Berne,¹ described a method of diagnosing this presentation by palpation, which I have since had repeated occasion of testing and verifying. Instead of feeling on both sides of the symphysis pubis the hard, round, more or less movable body which represents the fetal head, we find on one side a firm, smooth, convex surface corresponding to the forehead and vertex of the child, with a depression immediately above, caused by the back of the neck, and on the other side an indistinct resistance produced by the soft chin, neck, and thorax (Fig. 4). Owing to the peculiar position of the child, its feet are felt, and, contrary to the rule, the pulsations of its heart heard, on the side corresponding to the chin.

These signs thus enable us, not only to detect the actual presence of a face presentation before labor has commenced, but even to determine the side to which the forehead is turned, a not unvaluable piece of information, considering how difficult at an early stage of labor the differential diagnosis of face presentations usually is, and useful in case version should become necessary.

Prof. Spiegelberg says that similar conditions are found in high antero-vertex presentations.

Ordinarily it is not difficult to distinguish the two large round parts of the fetus, the head and the breech; occasionally, however, when the abdominal walls are very thick or rigid, the uterus contracted, or the child small and very movable in a large amount of liquor amnii, it will be found almost impossible to arrive at a definite diagnosis. The hardness and roundness and greater degree of ballottement of the head, the depression of the neck between the head and shoulders, and the absence of the femoral prolongation peculiar to the breech, are the chief distinguishing marks. Fassbender² declares that the parchment-like crackling of the cranial bones, occasionally discernible per vaginam, may under favorable circumstances (certainly only with very thin uterine and abdominal parietes, I should think) also be felt by abdominal palpation, and serve to distinguish the head from the breech in breech and transverse presentations. Sometimes the small size of the child renders the

¹ M. f. G., B. 32.

² M. f. G., B. 33, p. 435.

ischial tuberosities unusually prominent and pointed, and may lead to the breech being taken for the extremities ; the ballottement, which the latter never possess, will, however, prevent this mistake.

The two extremities of the fetal ovoid having been found, it is generally easy to discover their connecting link, the *back*, which in longitudinal positions is usually directed either to the left or right side. It may be recognized occasionally by being distinctly palpable, ordinarily only by the greater resistance which it imparts to that side of the abdomen ; this sign is so well marked, however, as to be unmistakable. Frequently the back will not be found entirely in one lateral half of the abdomen or turned directly towards one side, but is situated near the median line, more or less in that half of the uterus in which the extremities also are situated ; still, on careful examination it will appear that the back points often a little anteriorly, but always towards the side in which the extremities are not, thus clearly designating the subpresentation (I. or II.), and preventing error. It is more common to find the back turned towards the left side in I. subpresentations than the reverse, because of the usual inclination of the fundus uteri, and with it the upper half of the child, towards the right side. If in such cases no extremities can be found, they must be considered to be in the posterior part of the uterus, as is easily explained by the position of the back near the median line. Except in cases similar to those just mentioned, in which the whole fetus occupies one lateral half of the abdomen, usually the right, the body and legs of the child are generally found on opposite sides of the median line.

The *extremities*, characterized by their small size, mobility, and by the quick, short blows they impart to the examining hand, are unmistakable and need no further description.

Footling presentations are distinguishable from breech presentations only with great difficulty by external examination.

Schroeder (l. c.) says that the former may be diagnosed, if the breech has deviated somewhat towards the side where the back is situated, thus in I. subpresentations, towards the left side.

Transverse Positions.—In these the fundus and lower segment of the uterus are empty, the long axis of the abdomen

corresponding generally to its transverse diameter; on either side a large body is palpable, to which the above-mentioned distinguishing marks may be applied, and frequently, although not always, a long hard surface stretching between these two bodies representing the fetal back. Should this hard surface not be palpable, the probability is that the back of the child is turned towards the spinal column, or that the thickness of the intervening tissues prevents its being felt.

In oblique positions, which are merely temporary deviations from longitudinal or transverse positions, the head or breech is found in one or other iliac fossa, or resting on the right or left border of the pelvic brim, and the body of the fetus occupies a more or less oblique position in the uterine cavity. Generally, these positions voluntarily change, when labor commences, into regular longitudinal or transverse positions, and are always particularly amenable to rectification by external manipulation.

Twins.—The diagnosis of the presence of twins, before the birth of the first child, if at all possible, is so only by combined external and internal examination, and can be made with absolute certainty only when, in addition to the detection of a fetal head or breech per vaginam, a second head or breech is distinctly felt through the abdominal walls, or when two distinct and separate heads or pedal extremities are palpable externally, in short, when two absolutely identical parts are present. Occasionally it is possible to define the bodies of the two fetuses more or less clearly by palpation, and at times the great mobility of the parts palpable through the abdominal walls, whereas the presenting part is felt per vaginam to be already fixed in the pelvic cavity, may lead us to the supposition and detection of a twin pregnancy. I once detected twins in Vienna in a case where they had not been suspected by the assistants who examined before me, by comparing the small size and mobility of the presenting head with the large size of the abdomen, which evidently was not due to hydramnios. I asked myself the question: Why should the presenting head be so small, and consequently so movable, and the abdomen so large unless there were hydramnios or twins? Palpation told me that there was no unusual amount of liquor amnii present, consequently there must be two fetuses in utero. I

hazarded the diagnosis, and was gratified at hearing the next morning that the woman had been safely delivered of twins. In general, the size and shape of the abdomen, the longitudinal furrow in the median line (usually merely theoretical), the seeming multiplicity of small members, the exceedingly active, ubiquitous motions of the child, the sensations of the mother, even the hearing of the fetal heart-sounds at different spots of the abdomen, are all uncertain and treacherous signs compared with the detection of two identical parts. Of the numerous cases of twins which I have seen either under my own care or in various hospitals, only a very small minority have been detected before the birth of the first child, notwithstanding the customary careful external and internal examination. That the recognition of the presence of three or more fetuses in utero is possible only under most exceptional and favorable circumstances is evident.

The only instance, so far as I am aware, mentioned in literature of the diagnosis by palpation of triplets is reported by Dr. Pinard.¹ The careful palpation of the very much distended abdomen revealed the presence of three heads, one in the superior strait, another in the right iliac fossa, and a third very movable and above the umbilicus. This fact was so clear that the diagnosis of triplets was unhesitatingly made, and confirmed at the confinement three months later. Two distinctly separate fetal heart-sounds could only be heard, one to the left below the umbilicus, the other to the right side above. In a case of triplets observed by me, the presence of a second or third child was not suspected until the preceding one had been expelled. This was in a great measure owing to the immense accumulation of adipose tissue in the abdominal walls.

PALPATION AFTER DELIVERY.

Immediately after the expulsion of the child, the palpating hand shows us the uterus diminished to less than one-half its size during labor, reaching not quite up to the umbilicus and frequently presenting an irregular outline. This irregularity manifests itself by a greater prominence of one or the other cornu, and denotes the site and the non-detachment of the placenta. During the expression of the placenta, the uterus

¹ *Annales de Gynécologie*, Jan., 1877.

contracts proportionately, and immediately after the expulsion of the placenta is felt as a hard, smooth ball, reaching scarcely midway between umbilicus and pubes. Within several hours after delivery, however, the uterus again expands somewhat, rises out of the pelvis, and the fundus is then felt at about the same altitude as before the expulsion of the placenta, generally slightly turned towards the right side. Slowly and gradually the uterus decreases in size in the course of normal involution, and at the end of the second week the fundus still projects 5.2 cm.; at the end of the third week, 4.6 cm. above the symphysis pubis. Not until the end of the second month may the uterus be considered as restored to its normal position and weight, when, although it still projects about 3 cm. above the symphysis, it is no longer palpable by the external hand alone.¹

A distended bladder or rectum may displace the uterus to one side, generally the right, or cause the fundus to reach higher than normal.

The flaccidity of the abdominal parietes after delivery will frequently permit the palpating hand to detect abnormalities and tumors of which no previous suspicion was entertained. Thus I have recently had a case in my service at Maternity Hospital, in which a large subperitoneal fibroid was detected in the left cornu after delivery, and another in private practice at present, in which my palpating hand accidentally discovered a firm tumor in the left hypochondriac region, which, from its peculiar form and location, I am constrained to consider a floating kidney. The existence of either tumor had never been suspected before.

The importance of carefully palpating the abdomen during the lying-in state is obvious after the above remarks, and when we consider the frequent distention of the uterus with coagula during the first twenty-four hours succeeding delivery. I never omit to map out the fundus uteri with my hand at every visit to a puerpera during the first week post partum. Almost without exception the round and ovarian ligaments and Fallopian tubes can readily be felt at their points of departure from the uterine cornua, and occasionally the ovaries themselves may be palpated in very thin subjects. The pulsations

¹ Garrigues, "When shall Lying-in Women leave their beds?" Proc. Med. Soc., Co. Kings, Oct., 1877.

of the abdominal aorta can invariably be felt through the abdominal walls above the fundus uteri, and the vessel be compressed against the vertebral column, a procedure to be remembered in case of post-partum hemorrhage.

COMPLICATIONS OF PREGNANCY AND PARTURITION REVEALED BY
PALPATION.

The death of the fetus during pregnancy is not recognizable with certainty, but may be suspected, if the palpating hand discovers an unusual flabbiness and compressibility of the abdomen in contrast to its former firm and elastic feel, if the motions of the child are not distinguishable, if its body remain passively in any spot to which it is pushed and thus gives the impression of an inanimate body, if its head feels unusually soft and flaccid (unreliable), and lastly, if with all these signs the fetal heart-sounds also are inaudible. The mere absence of the heart-sounds at any one examination without any additional evidence is no proof whatever of the death of the child, as will be more distinctly stated hereafter.

Uterine contractions, even when not perceptible to the patient, are easily recognized by the palpating hand before, during, and after labor, and the difference in nature and degree of the pains (so-called false or true, partial, weak, spasmodic, tetanic), or their entire absence (*inertia*, atony, exhaustion, paralysis, either general or partial of the uterus), determined without difficulty—a knowledge of vital importance for treatment and prognosis.

The size of the fetal head can only be approximatively ascertained by palpation. In cases where the parturient canal is more or less contracted by deformity of the bony pelvis, disease of the cervix (carcinoma), or uterine tumors (fibroid), it is of great importance to have at least a fair idea of the size and compressibility of the fetal head, and this can be gained by careful and practised palpation, together with vaginal exploration and a comparison of the general dimensions of the child. External examination in such cases will teach us more about the prognosis and treatment, whether the latter is to be manual or instrumental, or whether the delivery is likely to be terminated by the unaided efforts of nature.

Hydrocephalus may occasionally be diagnosticated by pal-

pation, if the head is found to be unusually large, comparatively soft, and even faintly fluctuating, and if, in a normal pelvis, it remains above the brim in spite of energetic uterine contractions.

In rupture of the uterus during natural delivery, palpation gives us probably the most positive information. If the laceration is sufficiently extensive, the fetus usually escapes into the abdominal cavity, either partly or wholly, and is then felt with much greater distinctness than when still in the uterus, which organ contracts and occupies the side of the abdominal cavity opposite that containing the fetus. The appearance of the abdomen in well-marked cases is almost characteristic, one side showing a distinct rounded tumor, the contracted uterus, which is much smaller than when it contained the fetus, and the other the body and limbs of the child, the latter in thin subjects especially appearing as though they were covered only by the skin. A more or less defined depression separates the uterus and the fetus. "When the fetus does not thus escape, the fundus uteri commonly falls to the opposite side to that in which the rupture has taken place, owing to the local paralysis of the latter" (Chadwick, *l. c.*). Later on the uterus becomes more relaxed, and blood serum and liquor amnii may collect in and distend the dependent portions of the peritoneal cavity.

A new symptom of rupture of the uterus recognizable by inspection and palpation was witnessed by Tully¹ in a case at the Maternité in Paris in 1867, viz., the appearance of "a voluminous tumor just above the pelvis, resembling the distended bladder, but more clearly defined, appearing to be filled with a gelatinous mass." There was no other sign of rupture, but after the version and delivery of a dead child, at the autopsy a small circular perforation and a large rent were found in the anterior wall of the neck, the latter communicating with a large subperitoneal cavity filled with coagula—the suprapubic tumor before death. Hecker corroborates this symptom, and says that it may appear in the hypogastric or inguinal region or in the vagina. Its occurrence in the last-mentioned locality was observed recently by Dr. R. J. Preston, of Abingdon, Va.²

Dr. John S. Parry³ mentions "the appearance of a fluctuat-

¹ AM. JOUR. OBST., May, 1869.

² Virg. med. Mthly., Dec., 1874.

³ AM. JOUR. OBST., Aug., 1873.

ing tumor over the pubis before the death of the patient," in a case of rupture of the uterus witnessed by him. The significance of the suprapubic tumor was not appreciated until post-mortem. The importance of this symptom, as indicating the occurrence of a possibly as yet slight uterine perforation, which may be prevented from increasing by the timely extraction of the fetus, is obvious, and its proper appreciation may enable us to diminish the mortality of this accident.

Abdominal tumors, such as uterine fibroids, ovarian cysts, etc., are usually accessible only to palpation, and may be recognized by the irregularity which they impart to the general outline of the abdomen, increasing its breadth or size, or displacing the uterus if they be large, or destroying the smooth contour of the womb if they be situated in its substance.

Extrauterine Fetation.—The diagnosis of this condition is so uncertain, even with the aid of all the means at our disposal, that it will be possible to detect it by external examination only when a distinct lateral tumor is palpable, evidently unconnected with the uterus, in which (provided, of course, the gestation be sufficiently advanced) the fetal parts are plainly to be felt and the fetal heart-sounds clearly audible. The uterus can be felt in such cases only in extreme emaciation, as its enlargement never corresponds in degree with the period of pregnancy. Percussion may in the earlier months aid us in fixing the boundaries of the ovisac and thus corroborating the previously suspected diagnosis.

OBSTACLES TO PALPATION.

There are various conditions, temporary or permanent, which more or less interfere with the proper performance of palpation.

Tension of the abdominal walls, more common and continuous in primiparæ, is also found as the result of voluntary contraction of the abdominal muscles in multigravidæ, and is then usually overcome by the precautions mentioned under "*Position of the woman*." Occasionally it will be found an insuperable obstacle, and percussion may then be employed as a meagre substitute.

Muscular contractions of the uterus utterly preclude satisfactory palpation or auscultation. When they are seen to be

easily excited, the examination should be made with unusual care and delicacy, and, of course, only in the periods between the contractions. The latter are also aroused by voluntary contractions of the abdominal muscles, which must be prevented by requiring the woman to keep her mouth open or count in order to prevent her from straining.

Unusual tenderness of the abdomen is generally only partial, in spots where the constant kicking of the child has produced a feeling of soreness, or where the fetal head presses firmly against one or the other inguinal region. This sensitiveness is rarely sufficient to preclude careful palpation, although there are rare cases in which there appears to be such a degree of hyperesthesia of the peritoneal envelope of the uterus as to render abdominal palpation entirely unbearable. This abnormal sensitiveness is thought to be due to a chronic state of subacute peritonitis caused by the hyperdistention of the uterine peritoneum during pregnancy, and usually disappears towards the end of gestation.

Hydramnios, if at all sufficient to warrant the name, is almost always an insurmountable obstacle to palpation. The hand can make but little impression on the distended elastic abdominal walls, and the only information of the presence of a fetus will be imparted by the occasional thump of one of the large parts of the child, head or breech, against the hand, particularly if the presenting part be pushed up per vaginam. In lesser degrees of distention, the fetus is extremely movable, ballottement is unusually distinct, and fluctuation may sometimes be felt.

An excess of *adipose tissue* in the abdominal walls is one of the greatest obstacles to successful palpation, particularly during the earlier months, and, although usually diminished somewhat towards term by the distention of the abdomen, is not entirely overcome by any means at our disposal.

Ascites and flatus will rarely interfere seriously with palpation, because in the former the fluid by its gravity seeks the deeper portion of the abdominal cavity, and the intestines, distended by the latter, will only serve to displace the uterus, generally to the right side. It is principally by increasing the tension of the abdominal walls that they prove an obstacle. Their presence is easily recognized by percussion. Simulated pregnancy, *graviditas nervosa*, owes its origin to the enlarge-

ment of the abdomen by the intestines distended by flatus, the movements of which, together with the spasmoidic contractions of the abdominal muscles, may closely resemble the fetal motions and have deceived even practised observers.¹

C.—PERCUSSION.

This is the least valuable of the four modes of procedure mentioned, and will generally serve only to strengthen the diagnosis formed by the other three. Through it we ascertain the degree of distention of the bladder, which certainly is of importance both during examination and labor as well as in the puerperal state, and is a prominent symptom, indeed the only external one in retroversion or flexion of the gravid uterus; as also the presence of feces in the colon. Should the thickness of the abdominal walls or their rigidity prevent successful palpation, we can detect the boundary of the uterus and the height of the fundus through percussion, a knowledge which can occasionally be acquired as early as the fourth month of pregnancy, especially with an empty bladder and an anteverted uterus. In this latter respect percussion is not to be undervalued, otherwise it is of but little practical value. The relations of the bladder and uterus in the earliest months of pregnancy, and the similarity in percussion-sound of uterine substance, the fetus, and the liquor amnii render such results as those claimed by Piorry, who professed to be able to diagnosticate pregnancy as early as the second month, and even the position of the fetus in utero during the later months by means of the plessimeter, doubtful and incredible.

D.—AUSCULTATION.

Next to palpation, auscultation gives us the most important and reliable information on the existence of pregnancy and the position of the fetus, for it enables us to hear: 1st, the pulsations of the fetal heart; 2d, the murmur in the umbilical cord, the umbilical or funie murmur; and 3d, the uterine or

¹ In this chapter on "Palpation," I have of necessity repeatedly quoted the substance, if not the words, of Chadwick's excellent paper mentioned above, because I found it at times impossible to improve either on his classification or description.

placental murmur, besides the regular pulsations of the abdominal aorta, and the gurgling noises caused by the fluids and air in the intestines. Of these three chief sounds, the first and third are audible in nearly every regular pregnancy, the second only rarely, and then under pathological conditions. Occasionally a splashing noise may be heard, due to the succession of the liquor amnii by the rapid and vigorous movements of the fetus. Several other sounds are audible during pregnancy and labor, such as the indistinct shock imparted to the abdominal walls by the fetal motions during the months immediately following quickening, the fetal shock; the muscular subsurrus of the exhausted uterus during a tedious labor, which often closely simulates the fetal heart; a rustling sound supposed to be produced by gaseous decomposition of the liquor amnii when the fetus is dead; and a series of rapid scratching sounds, attributed by Caillant to the separation and crushing of the placenta by the uterine contractions. By far the most important are the

Pulsations of the Fetal Heart,

which, when distinctly and clearly heard, besides determining the existence of pregnancy, leave no doubt of the presence of a living and generally healthy fetus.

Although various observers, such as Depaul, Cazeaux, Henning,¹ and recently Underhill,² claim to have heard the fetal heart before the eighteenth week of intrauterine life, the two last-named unquestionably even as early as the fourteenth week, such cases are exceedingly rare, for all authorities agree that they are first audible in the period from the eighteenth to the twentieth week (Scanzoni even says rarely before the twenty-fourth week), before which time the diminutive size of the fetal heart, the comparative preponderance of amniotic fluid, and consequent only exceptional approximation of the child to the uterine walls, would naturally prevent their penetrating through the surrounding media. The case related by Depaul,³ and quoted by most text-books, of a woman in whom he heard

¹ Wiener Med. Halle, 1861.

² Obst. Jour. Great Britain and Ireland, Nov., 1875.

³ Traité d'Auscult. Obstétr., Paris, 1847.

the fetal pulsations (148 to the minute) eleven weeks after possible impregnation, is not quite beyond question, because his own figures show that at least three months had elapsed from the date of the first coitus.

In another case, Depaul detected the pulsations in the fifteenth week, and Dr. Ritchie¹ mentions one where he heard them certainly before the sixteenth week, at some period between the twelfth and sixteenth week. Of seventy-three cases which Depaul examined for the purpose, before the twentieth week, eleven were in the third month, and in none were they audible; twenty-two were in the fourth month, in two of which only, both at three months and a half, could they be heard; and in the remainder, who were more than four months pregnant, the fetal heart could be heard in the majority of the cases.

Nægele² gives the eighteenth week as the earliest period at which he heard the fetal pulsations, and Evory Kennedy says that as a rule they must not be expected before the time of quickening, although in rare cases they may be detected before the end of the fourth month. Leishman and Playfair both mention the eighteenth to the twentieth week as the average period at which they can be heard.

I myself have lately heard the fetal heart distinctly (152 per minute) in a lady pregnant with her third child, in whom the last menstruation ceased exactly seventeen weeks to the day before I made my examination. She had plainly felt quickening nineteen days before, that is, during the fourteenth week.

As Underhill says (l. c.), the question of the earliest period at which these sounds can be heard is of great importance for two reasons: 1st. To aid in fixing or confirming the diagnosis of early pregnancy; 2d. From a physiologically interesting standpoint, to show at how early a period of development the fetal heart is capable of producing sounds audible through the abdominal walls of the mother. According to Schroeder, during the fourth lunar month, the fetus is from 10 to 17 cm. (4 to 6½") in length, and weighs as much as 1,860 grains, or about 3½ ounces. The somewhat remarkable fact, that so small an organ as the heart of a fetus of that size is capable

¹ *Obstet. Jour. Gr. Br., N.s.v., 1875.*

² *Treat. on Obstetr. Auscult.*

of such energetic contraction as to be audible through several media, may be explained by the anatomical truth that the fetal heart during the early months is relatively much larger in proportion to the remainder of the body than later in intrauterine life, or in the adult. According to Meckel, at the second month the proportion is as 1 to 50; at birth, as 1 to 120; and in adult life, as 1 to 160.

As in auscultating for other sounds, so also are the fetal heart-sounds audible either by direct aural or by mediate stethoscopical auscultation. Doubtless there are many objections to direct auscultation, such as uncleanliness or contagious disease of the woman, scabies, for instance; the impracticability of applying the ear to the abdomen during the earlier months, when the uterus has risen but a few inches above the symphysis pubis; the necessity of depressing the head so much as to interfere with regular cerebral circulation, and thus impede hearing, or of pressing the ear in so deeply if the woman is very fat, or there is an excess of liquor amnii, or the womb is separated from the abdominal parietes by intestinal convolutions, whereby also the acuteness of hearing is weakened; the distaste naturally felt by a lady to the proximity of the examination; and various *bruits* from the observer's hair, whiskers, clothing, interfering with the clearness of hearing. All of these objections are certainly avoided by the use of the stethoscope, indeed frequently one or other of them will imperatively demand the employment of that instrument. But, for my part, I have always practised and prefer direct auscultation, the ear being separated from the abdomen only by the chemise or a thin handkerchief, because I have found it easier to find and localize the pulsations to one particular region by this method; once found, the stethoscope no doubt aids in rendering them more distinct for counting. The majority of obstetricians prefer mediate auscultation (Playfair does not even mention the direct method). Influenced by the above objections, and under the same circumstances, I certainly agree with them. Playfair says that, after failing with the ordinary instrument, he has occasionally succeeded with the bin-aural stethoscope, so generally used in this country, which intensifies the sound in a remarkable manner. An objection to the

stethoscope, which might lose its triviality in some cases, is that the abdomen requires to be laid bare.

If we apply our ear directly or mediately to the abdomen of a pregnant woman after the fifth month, we can under ordinary circumstances easily hear the rapid dicrotic (double) beat of the fetal heart, which is entirely similar in rhythm to that of an adult heart, only twice as fast and much fainter, and can, therefore, with proper care never be mistaken for the pulsations of the abdominal aorta of the mother, which are synchronous with her radial pulse, however quick that may be. This peculiar, rapid double beat of the fetal heart, when once distinctly heard, is always recognized; it has very properly been compared with the ticking of a watch heard through a pillow, and its pulsations are ordinarily easily counted. They number from 120 to 160 per minute (according to Slater from 120 to 140, averaging 132), and their rapidity remains the same, as a rule, with slight variations, during the whole pregnancy; they gradually gain in strength, however, with the increasing growth and vigor of the child, and consequently become plainer the nearer the gestation approaches to term. Disturbing causes, such as pressure with the hands or stethoscope, manipulations, mental or physical excitement of the mother, may accelerate them or render them irregular, and uterine contractions during labor, or fetal or placental disease may diminish their frequency or change their rhythm.

Inasmuch as this peculiar sound is neither producible by nor attributable to any other organ than the fetal heart, its presence is the only absolutely certain sign of existing pregnancy. Stress must be laid on the fact that its not being audible at a given moment by no means in itself disproves the existence of pregnancy or the presence of a living child, for there are certain conditions, such as excessive quantity of amniotic fluid, thickness of the abdominal walls, attachment of the placenta to, or the presence of fibroid tumors in the anterior wall of the uterus, an exceedingly loud uterine murmur, great inmobility, and particularly an unfavorable position of the fetus, in which its back is removed from the anterior wall of the uterus, and the presence of uterine contractions, which, through their compression of the placental circulation after rupture of the membranes temporarily suspend the fetal cardiac pulsations (a circumstance to which attention has been

called by Hüter, in Marburg, and Schwartz, in Göttingen), and which I have very frequently observed myself—all of which conditions may for a time prevent the pulsations from being heard by the auscultating ear.

Generally we hear them with sufficient distinctness to enable us to count them, but frequently, owing to the above-mentioned reasons or to natural weakness of the child, they are very indistinctly audible, as if coming from a distance, and occasionally I have remarked nothing but an indefinite murmur or thrill imparted to my ear, giving me, however, a sign which, by dint of long practice, and aided by the peculiar sense of elasticity perceptible to the ear when applied directly to the abdomen in a normal, healthy pregnancy, I considered perfectly conclusive of the life of the fetus. I have too often experienced this almost indefinable sensation to regard it as mere imagination; it can be explained in no better manner, perhaps, than by saying that intuitively, as it were, the practised touch acquires a vague, indescribable impression of the presence of a living body within the abdominal cavity. It must be this peculiar sign which Pajot¹ calls by the name of "*choc fœtal*," and declares exceedingly valuable, particularly during the fourth and fifth months. He describes it as I do—a sensation of shock and abrupt *bruit*—very delicate, very faint, and still certain, and always recognized by a practised ear. Of course, I should hardly rely on this evidence alone in determining the life or death of the fetus in a doubtful case.

Occasionally we can only hear the beating after some search, and then only in one small spot, beyond a certain radius of which it becomes weaker or entirely inaudible, and frequently it changes places in accordance with the altered position of the fetus; we should, therefore, never be satisfied with one auscultation, and thereon base our diagnosis, for I have frequently seen cases where the pulsations were first extremely distinct at one spot and then disappeared entirely, the fetus having probably altered its position and removed its thorax or back from the anterior uterine wall, and on examination some time after, were again found at or near the old place. Out of 906 cases examined by Depaul during the last three months of pregnancy, only in 8 was he unable to detect the

¹ *Traité d'Auscultation Obstétricale*, Paris, 1847.

fetal heart; and only in 12 out of 180 cases did Dr. Anderson, of Glasgow, meet with the same result, and in each of these 12 the child was still-born (Playfair, *l. c.*). To pronounce the child dead, on the strength of the absence of the fetal cardiac pulsations at one examination, would thus manifestly be a rash proceeding. It is only when several auscultations at different periods, and made, if possible, by several competent persons, give the same negative result, that we should feel justified in pronouncing the child to be dead, especially if other pathognomonic symptoms, such as peculiar sensations of the mother, a feeling of weight and want of life in, and flabbiness of the abdomen, etc., come to our aid. Should the pulsations be audible at different spots of the abdomen, the place where they are loudest would indicate the closest proximity of the child, generally its back or side, sometimes its thorax, and thus serve to determine the position. As a rule, the thinner the uterine and abdominal walls, the more developed the fetus, and the nearer its thorax or back to the anterior wall of the uterus, the more clearly and distinctly audible are the pulsations of the fetal heart, and the left occipito-vertex presentation being the most common, it is chiefly at the lower part of the left side of the abdomen that we can hear them most loudly.

Owing to the peculiar position of the fetus in utero, it is evident that that portion of its body where the sound of the fetal heart is produced cannot be contiguous to the anterior wall of the uterus (with only one exception, *i. e.*, during the mechanism of a face presentation); it is, therefore, generally the dorsal surface of the thorax which approaches the anterior part of the uterus, and from which the fetal pulsations are transmitted. Should the back perchance be turned away from the maternal abdomen, and point either to her back or sides, the pulsations will usually be inaudible or very indistinct.

We thus find the sounds in vertex presentations best audible at either side of the abdomen *below* the umbilicus, generally on the side opposite to that where the feet of the child are palpable. Occasionally, especially in obliquity of the uterus, the whole body of the fetus inclines to one side of the median line, and we then find back, feet, and pulsations all on one,

usually the right, side ; the direction of the back will, however, indicate the position to us, and prevent an error. Scanzoni holds the opinion that it is safer to determine the position from the pulsations of the fetal heart than from the often indistinct palpation of the members of the child, especially in doubtful cases, where these two signs seem to be in opposition to each other ; should the feet of the child apparently be on the right side and the fetal heart be also best audible there, he would still consider the back of the child to be directed toward the right side of the mother, and attribute the apparent irregularity to a peculiar torsion of the body of the fetus, its back being turned anteriorly, but still in the right half of the uterus.

It is only in *face presentations*, where in the later stage of labor the peculiar posture of the child (chin anteriorly and removed from thorax, occiput on nucha) approaches the anterior wall of the thorax to the anterior wall of the uterus, that the pulsations are heard on the same side with the feet, close to the median line ; at an earlier period, however, while the forehead and vertex with the back are still turned more towards the lateral and anterior portion of the uterus, that is, before the face has entered the superior strait and the rotation of the chin forwards has commenced, the pulsations are audible, as in *vertex presentations*, on the side to which the dorsum is directed.

In *breech presentations*, the thorax of the child is situated higher in the uterus than when the head points downwards, and consequently the fetal heart is heard on either side also, but usually on a level with or *above* the umbilicus. In *transverse positions*, we hear it below the umbilicus near the median line, but generally a little towards the side where the head is situated.

Owing to the frequent variations and the uncertainty of always hearing the fetal heart in similar positions in exactly the same particular place, it is evident that the distinction of vertex from face, and breech from footling presentations cannot be made alone from this sign, which, in such cases, can only be considered as a confirmation and valuable adjuvant.

The different subpresentations of each of the above can, however, generally be easily distinguished by auscultation alone,

in those designated as *first*, the fetal heart being almost invariably audible on the left, and in *second*, on the right side of the median line. In face presentations, as before mentioned, the conditions are reversed: *first* subpres. (forehead left, chin right), fetal heart on the right; *second* (forehead left, chin right), on the left side.

Since the discovery of the audibility of the fetal cardiac pulsations, the most remarkable theory regarding them is that first proclaimed by Frankenhäuser, of Jena, in 1859,¹ to the effect that the sex of the fetus in utero can be determined as soon as the fetal heart is distinctly countable, by the relative frequency of the pulsations, those of the male children being less rapid than those of the females. Finding that the cardiae pulsations of one hundred children, whose mothers he had examined during pregnancy and labor with the object of comparing the frequency of the fetal pulsations at these two periods, differed materially, and that the less frequent pulsations always occurred in women who were subsequently delivered of boys, and the more rapid in women who gave birth to girls, he proceeded carefully to count the fetal pulsations in fifty gravidæ and regularly noted down the probable sex of the fetus as indicated by the pulsations. In all of the fifty cases he predicted the sex correctly, twenty-two of the children being boys and twenty-eight girls; the average rapidity for the boys was 124, for the girls 144 pulsations per minute. This difference continued for some time after birth.

A statement so astonishing and interesting, both to the profession and the lay public, could not fail to excite widespread comment and frequent investigation. The first to report his disappointment was Prof. Breslau, of Zürich, who, in March, 1860,² published the results of his examination of fifty pregnant women, in twenty-five of which he made a wrong, and in nineteen a correct diagnosis (six cases being omitted as uncertain). He consequently expresses his belief that Frankenhäuser's luck in not missing once in his fifty cases was like the luck of a player at "*rouge et noir*," and that the celebrated discovery "is based on error and self-deception." As regards the continuance of the difference in pulsation after birth, asserted by Frankenhäuser, Breslau gives a table of thirty

¹ *Monatsschr. f. Geb.*, XIV., 3.

² *Mon. f. Geb.*, 1860.

children examined by him within twenty-four hours of their birth, according to which it appears that the average of cardiac pulsations of boys was 119, of girls 113, thus showing a diminution in rapidity for both sexes, but particularly for the girls.

Hennig, of Leipzig, in the same number of the *Monatschrift für Geburtshilfe*, reports twelve cases, five boys with an average cardiac double pulse of 143, and seven girls with 155 per minute. The fact that several of the observations made on girls were made very early in pregnancy, as soon indeed as the fetal heart became audible, in a measure invalidates their testimony, for, as he himself says, the frequency of the cardiac pulsations of the fetus are in an inverse ratio to the number of months of gestation.

Haake, of Leipzig (*ibid.*), also reports fifty cases, and finds that the frequent variations in the rapidity of the fetal pulsations during pregnancy, influenced, no doubt, by the movements of the fetus and probably other, to us unknown, exciting causes (a fact already pointed out by Hohl, in 1833¹), render the possibility of determining the sex of the fetus therefrom exceedingly doubtful. Although employing all the precautions recommended by Frankenhäuser, Haake was unable to diagnose the sex of the fetus correctly in a single instance. He also differs from Hennig in not having been able to find a proportionate decrease in the rapidity of the fetal heart with the advance of pregnancy.

Steinbach,² on the other hand, corroborates the statements of Frankenhäuser, making the average 131 for males and 138 for females, and predicting the sex correctly, and Zepuder³ in forty-five out of fifty-seven cases, after examining sixty cases, arrives at the same conclusion (average for females 138–144, for males 120–132). Notwithstanding this corroborative evidence, Scanzoni, in 1867,⁴ declares that his observations have led him to doubt the correctness of Frankenhäuser's statements, but advises further investigation of the matter, an advice which has been followed by Cumming, Wilson, Steele, Engelhorn, Hutton, Parvin, Devilliers, Peters, Mattei, Naylor, Budin, and doubtless numerous others, whose results have never been made public.

¹ Hohl, die geburtshülf. Exploration, Bd. I., 1833.

² Mon. f. Geb., Dec., 1861.

³ Wiener Med. Halle, 14, 1862.

⁴ Lehrb. d. Geb., I., p. 162.

One of the most original and searching articles on this subject has been written by James Cumming,¹ of Edinburgh, who examined first forty-one and later one hundred and twelve pregnant women, with the view of ascertaining: 1st, the relation between the sex of the fetus and the rapidity of its cardiac pulsations; 2d, the relations between the weight of the fetus and its cardiac pulsations; and 3d, the relation of the maternal to the fetal pulse. He arrived at the following conclusions:

1. That the indications resulting from auscultation of the fetal heart are of a certain value in aiding us to diagnose the sex of the fetus in utero, but cannot solely be relied upon. Of sixty-one cases specially selected for this examination, forty, or nearly two-thirds were correct, and twenty-one incorrect.
2. That there seems to be a relation (or ratio) between the weight and the pulsations of the fetus in utero. Some of the children had a rapid pulse and were predicted to be females, but at birth they were found to be males, of below the average weight (7.28 lb. for males); others had a pulse below the average (138) and were pronounced males, but at birth proved to be females of large size, exceeding the average 6.8 lb. for new-born female children. But of seventy-seven cases thus examined, in forty-seven this ratio was apparent; it would, therefore, seem that when the fetal pulse is below the average, the fetus is above average weight (of its sex), and *vice-versa*, when the pulsations are above the average, the fetus is below the average weight (of its sex).

3. That for the weight per pound, the pulsations are slower in the male than in the female.

4. That there is no relation between the fetal and maternal pulse.

Devilliers found the average in the sexes to be the same as Steinbach, but preceded Cumming in attributing the difference to the size and weight rather than the sex of the child, believing large and well-developed children to have slower pulsations, whereby the relatively less frequent pulsations of male children are accounted for.

Dr. J. T. Hutton, of Brooklyn, succeeded in correctly pre-

¹ *Edinb. Med. Jour.*, June, 1870, and Oct. and Nov., 1875.

dicting the sex in seven cases, and put the average number of pulsations, like Frankenläuser, at 144 for the females, and 124 for the males, allowing a variation of six beats upwards from 124, or downwards from 144, without endangering the diagnosis, if the auscultation took place in the ninth month.

Induced by Cumming's first publication in 1870, Dr. Frank C. Wilson, of Louisville, Ky., turned his attention to this subject and reported his experience in two interesting and able papers, printed in the *American Practitioner* for Dec., 1873, and Dec., 1875, the first containing an analysis of 126, the second of 106 cases, in which the sex of the fetus in utero was predicted. Of the first 126 cases, in 109 only were positively accurate notes kept, and only in 9 of these did the prediction of the sex prove incorrect; of the second series of 106 it is not stated in what proportion the diagnosis of the sex failed. Taking all these 215 cases, the average pulse was found to be for the males 125, for the females 143, for both sexes together 134, this figure being the dividing line between the sexes, a range 4 beats above or below which would constitute a doubtful zone, where it would be impossible to predict the sex with any degree of certainty. The ratio of pulsations for the two sexes in his 215 cases is given by Dr. Wilson as follows:

From 110 to 125.....	62	males	and	2	females.
“ 125 to 130.....	29	“	“	7	“
“ 130 to 134.....	14	“	“	4	“
“ 134 to 138.....	2	“	“	12	“
“ 138 to 143.....	2	“	“	23	“
“ 143 to 170.....	2	“	“	50	“

The following very useful table for the determination of the fetal sex has been formulated by Dr. Wilson from the above figures:

From 110 to 125 almost certainly male.

- “ 125 to 130 probably male.
- “ 130 to 134 doubtful, with chances in favor of male.
- “ 134 to 138 doubtful, with chances in favor of female.
- “ 138 to 143 probably female.
- “ 143 to 170 almost certainly female.

The results arrived at by Dr. Wilson will be seen to be unusually favorable to Frankenhäuser's theory, and no other author has so conveniently arranged his figures for practical

use. But they by no means settle the question, for a later publication by Engelhorn, of Leipzig,¹ finds, after a careful examination of thirty-seven cases, that no constant relation exists between the sex and the rapidity of the cardiac pulsations of the fetus. The average frequency for boys was indeed somewhat less, 137.7 to 140.8 for girls, but this difference is too slight, and too easily affected by external influences or the various times of examination, to be of any practical value, especially as some very low rates (128) occurred in girls, and very high ones (150 to 160) in boys.

As regards the relation between the maternal and the fetal pulse, Engelhorn found that to a maternal pulse of 60 to 80 beats, corresponds on an average a fetal pulse of 134.9 beats, and to the maternal pulse of 80 to 100 corresponds on an average a fetal pulse of 143.9, and he believes that this proportion is based on a more secure foundation than the dependence of the rapidity of the fetal pulse on its sex. As an explanation of this evident relation between the pulse-rates of mother and child, he says that, in the absence of direct vascular and nervous connection between the two, it may be supposed to depend on differences in the amount of carbonic acid in the blood, regulating the vaso-motor nervous centres of the fetus. Other observers, such as Fiedler,² Hohl, and Steinbach, have noticed a rise and fall in the fetal pulse, corresponding with similar variations in the temperature and pulse of the mother during typhoid fever and variola, but Engelhorn suggests whether it was not the high maternal temperature, more than the pulse, which affected fetal nutrition and cardiac contractions.

In accordance with the table by Volkmann, which shows that an average decrease of the pulse by 4.4 beats per minute, takes place in proportion to an increase in length of 10 centimetres of the whole body, Engelhorn found that to a body-length of 40 to 45 centimetres corresponded 147.9 fetal pulsations per minute; to 45 to 50 centimetres, 137.9 pulsations; over 50 centimetres, 126.6 pulsations. Whether this latter result is practically available to assist in determining the age of the fetus in utero is, however, pronounced doubtful.

Dr. D. A. K. Steele,³ from a careful record of fifty cases of

¹ Arch. f. Gyn., IX., 3, 1876.

² Mon. f. Geb., XIX.

³ Chicago Med. Jour., Sept., 1874.

pregnancy, arrives at the following conclusions: 1st, in the majority of cases male fetal hearts are slower than female; 2d, the average dividing line is 132 fetal pulsations per minute; below this $68\frac{4}{7}$ per cent are male, 20 per cent female, $11\frac{3}{7}$ per cent doubtful; above this $53\frac{1}{3}$ per cent are female, $26\frac{2}{3}$ per cent male, 20 per cent doubtful; 3d, the most accurate observations are made during the last four weeks of gestation; 4th, the rapidity of the heart's action is increased in proportion to the feebleness of the fetus; 5th, calcareous or fatty degeneration of the placenta renders the pulsations feeble and irregular; 6th, in some cases it would be possible to diagnose diseased conditions of the placenta from careful observation of the fetal heart; 7th, the weight of the child does not increase the force of the fetal heart.

In the same number of the same journal, Dr. Albert H. Strong, of Chicago, likewise reports his experience in fifty cases of pregnancy, in twenty-six cases of which a correct, in twenty-four an incorrect diagnosis was made. He found the average pulse of the males to be 136.3, of the females 137, which figures in themselves show the worthlessness of this test for determining sex in utero.

A like result is arrived at by Edward D. Peters¹ in thirty cases observed in the Boston Lying-in Asylum. He found the average pulse of males to be $136\frac{1}{4}$, of girls $146\frac{1}{2}$, a difference in itself sufficient to be of value, were not the fetal pulse subject to so many variations from external influences (exercise of mother, active motions of child, unappreciable causes) as scarcely ever to present precisely the same rate at any two examinations. Peters' observations show that, contrary to the law of extrauterine life, the largest children, male and female, had a considerably higher pulse-rate than the smaller ones (150 and 143 for largest girls and boys respectively; 143 and 131 for smallest girls and boys respectively).

Recently² Dr. Mattéi examined several hundred pregnant women and drew the conclusion that a fetal pulse below 135 indicates a male, above 150 female; only in three cases did his prediction turn out to be wrong, and these three were small and feeble females, whose pulse-rate was so slow as to be taken

¹ *Bost. Med. and Surg. Jour.*, Aug. 23d, 1877.

² *Arch. de Tocologie*, March, 1876.

for males. This conclusion certainly does not agree with the majority of those drawn from the careful and conscientious observations of the numerous writers above quoted, and I cannot help thinking, must be accepted with some hesitation as an example of unusually lucky guesswork.

The fallacy of estimating the sex of the fetus by the rapidity of its cardiac pulsations has recently been shown most conclusively by Mr. Chas. G. R. Naylor, of Edinburgh,¹ in a paper on "The Influence of Digestion in the Mother upon the Frequency of the Fetal Pulse." He examined five women in the Maternity Hospital of Edinburgh, at repeated intervals, half an hour before and two hours after each meal (dinner, tea, and supper), being careful to keep the woman absolutely quiet in bed, in the recumbent position for at least half an hour prior to each auscultation. He found the fetal pulse-rate invariably increased after meals, the increase ranging from 4 to 32 beats, a rise of 14 to 20 beats being the most frequent. The degree of increase did not seem to be affected by the article of diet, the highest rise of 32 beats following a tea of bread, butter and tea, and one of the lowest, 8 beats, a dinner of Irish stew and bread.

Dr. Willis E. Ford reports² the results obtained in sixty-two cases. The average pulse rate of twenty-four female children was 143, the highest 160, the lowest 120; of thirty-eight male children, the average was 142.5, the highest 170, the lowest 110.

The latest and also most positively adverse conclusion on this subject has been arrived at by Paul Budin and Chaignot,³ who, at the instigation of Prof. Depaul, examined seventy cases with reference to the relation between the cardiac pulsations and the weight and sex of the fetus. They decide that there is no absolutely practical relation between sex and pulsations, for the latter may and do vary from fifteen to thirty beats at different auscultations, and even during the same examination, and both high and low pulsations are found indiscriminately in children of either sex. As regards the relation of weight, pulsations, and sex, they found quite as much average variation, although in a certain number of cases they

¹ Edinb. Med. Jour., May, 1876.

² On the Diagnosis of the Sex of the Fetus in Utero, N. Y. Med. Rec., Dec., 1878.

³ Gazette médicale de Paris, April 12th, 1879.

detected a higher rate in the larger children than in the smaller (smallest boy, 2,175 grammes, 132 beats; smallest girl, 2,008 grms., 144; largest boy, 4,210 grms., 144; largest girl, 3,650 grms., 144-150), thus differing from Cumming's results in his second series above referred to. But they distinctly state, that *there is no relation whatever between the weight, cardiac pulsations, and sex of the fetus.*¹

All this mass of conflicting testimony, as is but too often the case in our scientific controversies, does not seem to have positively settled the question: Can the sex of the fetus in utero be positively and uniformly determined by the relative rapidity of its cardiac pulsations? In all probability, like the allied mystery of the influences directing the original sex of the child, it will ever remain a doubtful point, frequently open to correct, but usually chance, interpretation, and a fertile source for investigation and conjecture.

¹ Since this article went to press, two additional papers have appeared on this subject, one by Dr. P. V. Schenck, of St. Louis, in the *St. Louis Courier of Medicine* for August, 1879, and the other by Dr. Georges Dausats, of Bordeaux, in the *Archives de Tocologie* for July and August, 1879, which latter paper is still to be continued.

Dr. Schenck examined 160 cases, and found the following figures: Total average, 138.5; total male average, 132.6; total female average, 145.7; lowest male, 120; highest male, 160; lowest female, 125; highest female, 172. The most he can say is, that "in a large majority of cases the male heart beats slower than the female." Dausats' article, even in its present unfinished condition, is a very complete treatise on the subject, and is entitled, "Researches on the Frequency of the Fetal Heart-Sounds." It discusses the differences in frequency during pregnancy and labor as influenced by age, sex, weight, size, motion, sickness, multiple pregnancy, uterine contractions, dystocia, etc., and gives in a full historical review almost precisely the same authorities as quoted by me. Basing on very careful observations of 107 cases, to which he adds 428 collated from recent authors, being a total of 535 cases, he concludes that, 1st. There is a certain connection between sex and habitual frequency of the fetal pulse which, however, becomes appreciable only when the number of pulsations exceeds 145, or falls below 135. 2d. Above 145 it is generally a girl, below 135 a boy. 3d. Omitting the cases of a pulse-rate between 135 and 145, the prediction of the sex will prove correct on an average 7 times out of 10. When we consider that about as many girls are born as boys, it is evident that this proportion of correct prediction is only better by 2 out of 10, or one-fifth, than one might expect to obtain by a pure guess.

The number of the *St. Louis Courier of Medicine* above mentioned contains, by the way, a letter from Paris, by Dr. F. Hartmau, describing "Abdominal Palpation as a Mode of Diagnosing Fetal Positions and Conditions," a practice which the writer of the letter witnessed at the bedside and heard described in the college there, evidently as a result of the appearance of Pinard's book.

All authors hitherto have agreed in employing the necessary precautions during their examinations to avoid errors and attain as nearly as possible a uniform result. They have been careful to keep the women quiet in a recumbent position and free from mental or physical excitement, for some time before proceeding to auscultation; they have examined at different times, and compared the figures of each exploration, using only the average for their calculations; they have carefully excluded all doubtful cases in which the pulsations were not distinctly countable or in which some special cause for fallacy existed—they have done all this, and more still, to obtain a fair and truthful statement, and what has been the fruit of all their labors? Steinbach, Zepnder, Hennig, Huntington, Mattei, Cumming, and Wilson have (the last two only to a certain qualified extent) corroborated Frankenhäuser's observations, while the undoubtedly equally weighty evidence of Breslau, Haake, Scanzoni, Naylor, Engelhorn, and Budin, based on equally careful researches, utterly denies the existence of any law for the prediction of the sex of the fetus in utero, as its originator would have us accept. The latest and one of the ablest advocates of the law, Dr. Wilson, in his last paper (Dec., 1875) does not feel justified in saying more than that, "although the sex may not be determined with absolute certainty, yet we can certainly make a very shrewd guess;" and the last author but one on the subject, Engelhorn (June, 1876), concludes his paper with the remark, that his own and the observations of others justify him in believing that the influences governing the frequency of the fetal cardiac pulsations will probably never be determined with sufficient accuracy to enable us to draw from them, before birth, any positive conclusions regarding the sex of the fetus.

I regret exceedingly that I did not avail myself of the abundant and convenient opportunity offered me abroad to institute a systematic inquiry into the question, but I was in a measure deterred from thinking of it by the evident disbelief with which Frankenhäuser's discovery was regarded by Scanzoni, who apparently thought the matter settled in the negative. Whatever individual cases I may since have examined with the view of satisfying either the mothers or myself as to the sex

of the expected child, some with a correct, others, apparently equally certain, with a mistaken diagnosis, have led me to concur with Engelhorn's and Budin's opinion. You may be successful or you may not, in either case it is a matter of chance, and if correct, you get the credit of having made, as Dr. Wilson says, "a shrewd guess." Therefore it is best always to qualify your diagnosis as to the sex by saying that the *prima facie* evidence (the frequency of the pulsations) would denote a male or female child, as the case may be, but that the result will show whether your supposition is correct. The disappointment of finding a girl, when a boy is ardently desired, and has been promised by the obliging medical attendant, or *vice versa*, may cause serious trouble to the patient and much annoyance to the doctor.

The *therapeutical indications* to be derived during labor from irregularities in the fetal cardiac pulsations are exceedingly simple. As has already been stated above, during the normal uterine contractions or labor-pains the placenta is compressed and its circulation more or less interfered with, as long as the pain lasts; naturally the fetal heart is affected thereby, and its pulsations become for the time faint or diminished in frequency, to regain their normal strength and rhythm as soon as the disturbing compression ceases. From this normal intermittent irregularity the fetus in no wise suffers; should the uterine contractions, however, become so severe, constant, or rapidly recurrent as to continue this depression of the fetal circulation for some length of time, the fetal heart-sounds do not regain their normal power and rapidity, but grow fainter and fainter and more and more irregular and infrequent, until they finally cease entirely. This is apt to be the case in the spasmodic condition known as tetanus uteri, and after the use of large doses of ergot during the second stage of labor. The indication to check the excessive contractility of the uterine muscular fibres by narcotics and antispasmodics, and if unsuccessful therewith, to effect the delivery of the child as rapidly as possible if its life would be saved, is urgently imperative. Further, any constant and increasing irregularity of the fetal pulsations, during a severe or tedious labor, where the head is subjected to severe and lasting pressure, will demand the

speedy extraction of the child, as does also a non-reducible prolapse of the umbilical cord when the child is still alive and its heart shows signs of failing. As the fetal heart is the evidence of the life and health of the fetus in utero, it is evident that it should be carefully watched by repeated examinations during every labor in order to detect and remedy any danger to the child as soon as it occurs.

The Umbilical Murmur.

Not to be compared in interest or importance to the fetal cardiac pulsations, but still possessed of considerable scientific and some practical value, is the funic or umbilical souffle, a single blowing systolic murmur heard synchronous with the fetal heart (generally most distinctly at the spot where the latter is audible), in certain pathological conditions of the cord or fetus. This fact of its being synchronous with the fetal heart sufficiently distinguishes it from the uterine murmur, which coincides in rhythm with the pulse of the mother, and also greatly exceeds the funic souffle in strength and intensity. The first author whom I find credited with having pointed out this sign is Evory Kennedy in 1833,¹ who attributed the murmur to compression of the cord by its being wound or twisted around portions of the child's body, as he was able to produce it at will by pressure on the cord before detaching the child after birth. This opinion was shared by Naegele, Spöndli,² Devilliers³ and others, while Kiwisch, Mossman, Martin, and Breit endeavored to explain the sign in other ways. Breit took the untenable ground that stenosis of the cord was the main cause. Kiwisch utterly denied its causation through duplicatures of the cord, without offering any adequate explanation; Mossmann⁴ believed it to depend entirely on organic valvular disease of the fetal heart, basing his opinion on a case of his, where this pathological condition was found post mortem; Martin⁵ in twenty-three instances of funic murmur found only fourteen in which the cord was wound around the fetal body, and in twenty-eight cases of such duplicature there

¹ Treatise on Obstetric Auscultation, 1833.

² Mon. f. Geb., III., 1854.

⁴ Mon. f. Gel., IV.

³ Union Méd., II., 1854.

⁵ Ibid., VII., 1856.

was no murmur, wherefore he doubts the causative agency of the above anomaly. Gregor Schmitt,¹ of Würzburg, reported five cases in which the funic murmur was audible, in two of which the cord was found slightly wound around the neck of the fetus, in one it was prolapsed, in one no anomaly of the cord was detected, and in the fifth and most interesting case the autopsy, performed by Virchow, revealed marked hypertrophy of the right ventricle, insufficiency of the tricuspid and mitral valves, and numerous small, bright-red, gelatinous nodules on both these valves. This last case corroborates Mossmann's view, as also does a case reported by Andreæ.² Frankenhäuser³ and Hecker⁴ both locate the murmur in the umbilical arteries, the latter chiefly at the point of exit from the fetal body; whereas Scanzoni⁵ expresses decided doubts as to the possibility of a souffle occurring in such small arteries as the umbilical, and believes that, although the cause of the murmur in all probability generally consists in compression of the cord, the murmur itself does not originate in the funic vessels, but in the fetal heart, being caused by the rapid influx of the reduced volume of blood into the disproportionately large cardiac cavities, and thence transmission of the murmur throughout the cord. As evidence he quotes the above-mentioned case of Schmitt.

Schroeder⁶ states that the precise conditions under which the funic murmur occurs are not known, but that it undoubtedly occurs in the cord, probably close to the umbilicus, perhaps caused by flexion of the cord at the junction of the cord and skin; that he, as well as Hecker, found it less frequently when the cord was wound around the fetus, and that he therefore thinks this accident can scarcely be considered a cause. As a proof of its origin near the umbilicus he mentions the fact that it is generally best heard where the fetal heart is most distinct, but disappears at more distant spots, leaving only the clear, if faint, fetal pulsations.

The most complete recent paper (but one) on the subject is

¹ Scanzoni's Beiträge, 3, 1858.

² Diss. inaug., Königsberg, 1870.

³ L. c.

⁴ Hecker u. Buhl, Klinik der Geb., I.

⁵ Lehrb. d. Geb., I., 1867.

⁶ Geburtshilfe, 1872.

by Winckel,¹ who met with twenty-seven cases among three-hundred confinements, from which he drew the following conclusions, which I think may be considered as expressing most clearly the present state of the question : The souffle occurred in nine per cent of his cases (Frankenhäuser says eight per cent, Schroeder and Hecker give as high as fourteen to fifteen per cent; as far as my experience goes, I should incline more to the proportion stated by Winckel, making it even less frequent). It occurred with equal frequency in primiparæ and multiparæ. It was most frequent in vertex presentations, occurring only twice in breech and once in an oblique presentation ; thus refuting (as did also Hecker) Frankenhäuser's assertion that it is most frequently audible in breech presentations. The souffle was almost uniformly audible in the neighborhood of the fetal heart, the latter being clear and distinct at one spot, a few centimetres distant from which the souffle was loudest and the fetal heart less distinct. Winckel says that the souffle may be audible at a distance from the cardiac pulsations as well as close to them, thus in a L. O. A. presentation it may be heard on the right side of the fundus if the cord is compressed at that spot by the thigh ; but its being audible near the fetal heart is easily explained by considering that the compressed portion of the cord, if compression occurs by its being twisted around the body or one of the limbs of the fetus, is naturally, at the best, but a short distance from the fetal thorax and heart. The audibility of the murmur between the symphysis and umbilicus by no means necessarily indicates that the cord is wound around the neck of the fetus, as Frankenhäuser believed, because the latter accident occurs very much more frequently than the murmur ; and twisting of the cord in general is only occasionally accompanied by the souffle. (The four cases reported by Dr. Wilson,² in which he heard the funic souffle over the pubis, diagnosticated therefrom the twisting of the cord around the neck, and found his diagnosis confirmed at the delivery shortly after, are certainly too positive instances to permit of their being considered as mere chance coincidences. Perhaps we may put the facts thus :

¹ *Pathologie der Geburt.*, 1869.

² *L. c.*, 1873.

The non-audibility of the souffle over the pubis—or indeed anywhere—does not prove that the cord is not twisted around the neck or some other portion of the child; where it is audible, however, above the pubis, we may predict with tolerable certainty that the cord is coiled around the neck, or if audible elsewhere, around some other portion of the child.)

Winckel agrees with the majority of authors in locating the murmur in the cord itself, but believes that it occurs not only in the arteries of the cord, but even more frequently in the more compressible umbilical vein, basing his assumption on the fact that frequently a protracted funic murmur is not productive of evil to the child, which would scarcely be probable if arteries and vein were both obstructed. As regards the significance of the murmur, Winckel differs from Scanzoni, Hecker, Martin, and others (who deny that it has any practical importance), and agrees with Schmitt and Wilson, that a long-continued funic murmur cannot but be indicative of danger to the child, and may under appropriate circumstances call for active interference. During pregnancy, as Schroeder says, it possesses absolutely no practical value, for even if the exact condition causing the murmur could be ascertained (as, for instance, if the cord could be felt crossing the fetal back or limbs through the thin utero-abdominal walls, as Winckel and Spoendli claim repeatedly to have done), nothing could be done to remedy the malposition at the time. On such occasions the fetus must be left to change its position for a less precarious one by its own individual mobility.

To recapitulate: The funic souffle is caused by some obstruction to the flow of the blood through the umbilical vein or arteries, either both together or separately, if the latter, more likely the vein; or it may originate in the fetal heart itself, when its valves are diseased. The obstruction in the cord may be produced either by its compression between the body of the fetus and the organs of the mother (as in prolapsus of the funis), or by its being more or less tightly wound around the neck, body, or limbs of the fetus, or finally by its being tied in a true knot (a very rare occurrence). Owing to the frequent changes of position of the child, and the slipping of the loop of cord in consequence, the compression is often

removed and the murmur thus necessarily becomes intermittent, being audible at one examination and inaudible at another; if it is permanent and always in the same place, the inference would be that the cord is either tightly wound around the neck, perhaps more than once, or that it is tied in a true knot. The audibility of the murmur over the spot where the neck has been ascertained to be, although favoring that view, does not necessarily or invariably denote that the cord is wound around the neck (as Wilson asserts); neither is it a natural inference (also Wilson), if the murmur is heard not at the neck, but at some point in the course of the cord, that it is caused by a knot at that place. Case forty-seven reported by Dr. Wilson,¹ of a constant funic scuffle being heard at the neck, which was thought to be due to the cord being around the neck, but which at delivery proved to "be caused by an excessively varicose condition of the funis" itself disproves the uniformity of the rule laid down by him.

The most recent contribution to this subject has been offered by Pinard,² of Paris, who made a series of exceedingly interesting experiments on a large number of umbilical cords, taken from women whom he had repeatedly examined during gestation and labor, from which he drew the following conclusions, of which the second will be seen to be novel and especially interesting. When a pregnant female is carefully examined by auscultation during the latter half of pregnancy, three varieties of fetal murmurs may be heard:

1. A murmur corresponding to the first sound of the fetal heart, which is muffled instead of being sharp and distinct. This is a cardiac murmur, is permanent, and disappears some hours or days after birth.

2. A murmur with its maximum at a greater or lesser distance from the fetal heart. This is a funicular souffle, which may be single or double, and is due to the presence of well-developed semi-lunar or diaphragmatic valves, either in the vein or the arteries, or in both varieties of vessels together.

3. A single transient murmur, isochronous with the pulsation of the fetal heart, but stronger than either of the above varieties. This funicular souffle is due to a passing compres-

¹ Am. Pract., Dec., 1873.

² Gaz. Méd. de Paris, March 18th, 1876.

sion of the elements of the cord, either by the fetal parts themselves or by the stethoscope.

As will be inferred from what has already been said, the scope for operative interference on the part of the obstetrician in cases of funic murmur during actual labor is exceedingly limited, being confined to the removal of pressure from the cord by a suitable lateral or knee-elbow position, if the seat of compression can be ascertained by indagation, as in presentation of the cord before rupture of the membranes, or if the murmur continues after the prolapsed cord has been replaced, or by manual or instrumental reposition of the actually prolapsed cord; further, to the rapid loosening of the coils of cord around the child's neck, as soon as the head emerges from the vulva, if the seat and persistence of the murmur lead to the supposition that this is the case; finally, to the speedy delivery of the child by whatever means may seem feasible and advisable, if the constancy and increasing force of the murmur, especially if coupled with an irregularity or growing indistinctness of the fetal heart, indicates serious danger to the child. The necessity, therefore, of carefully watching both the murmur and the fetal heart during every case of funic souffle *inter partum* is obvious.

The Uterine Murmur.

As early as the fourth month of pregnancy, soon after the uterus rises out of the pelvic cavity, the auscultating ear in the majority of cases readily detects a single blowing or wheezing sound synchronous with the maternal pulse and generally audible in greater or lesser intensity all over the uterine ovoid. As pregnancy increases, it becomes louder, often overpowering the fetal heart-sounds, and is most plainly heard in either inguinal region, more rarely in the median line and near the fundus. The sound is usually so distinct that even superficial auscultation cannot fail to distinguish it, but its intensity and site frequently vary, and at times it may be very faint or entirely inaudible, or have disappeared from the spot where it was once plainly audible, to be heard only on the opposite side of the abdomen. This irregularity is attributed by Braxton Hicks, during gestation, to the normal intermittent uterine contractions

occurring during the second half of that period (already referred to under Palpation), and his opinion derives unquestionable support from the well-known influence which the uterine contractions during labor produce on the uterine murmur. At the inception of a pain, the murmur increases in intensity, but rapidly diminishes and entirely ceases at the acme, to reappear again when the contraction has passed away. Whether it is possible to distinguish the true from the so-called spurious labor-pains by the above test, as Dr. Wilson asserts,¹ seems to me doubtful, if we accept Dr. Hicks' explanation of the intermittence of the murmur during pregnancy. Nor is this test needed, for a vaginal examination will usually tell us whether the alarm is a true or false one. Neither am I quite sure of the correctness of Dr. Wilson's assertion, that the continuance of the murmur after the expulsion of the placenta indicates a "relaxation of the uterine walls incident to concealed hemorrhage" and serves as a warning to the obstetrician. At least, Scanzoni² says that he has heard it on the fourth and sixth days post partum, without making mention of its being a diagnostic sign of impending post-partum hemorrhage or of that accident having occurred in his two cases.

The causation of the puerperal souffle, as it is also called, has been the subject of even more discussion than that of the funic murmur. The various theories held by Kiwisch, Bouillaud, Depaul, Dubois, have already been briefly mentioned in the Historical Sketch. Scanzoni, in the fourth edition of his Treatise on Obstetrics, 1867, expresses the conviction (held also by Depaul) that the uterine murmur is caused, in the majority of cases, by the rushing of the blood in the tortuous branches of the uterine arteries, particularly in either inguinal region, where this tortuosity is most marked and where the murmur is ordinarily most pronounced; that it may also be produced by the passage of the blood from the arteries into the large veins of the uterus, a view coincided in by Dubois and later by Skoda³; and finally, that in a few cases, where a slight pressure on the external epigastric arteries is shown to modify or arrest the murmur, the latter vessels may certainly be con-

¹ L. c., 1873.

² L. c., Vol. I., p. 167.

³ Percussion and Auscultation, sixth edition.

sidered to be the seat of that murmur. This latter theory, originally held and ultimately relinquished by Kiwisch, and admitted by Scanzoni for certain rare cases, has recently been revived by François Glenard, of Paris.¹ By direct observation, he claimed to have found that, when the abdomen is distended, the stretching is not uniform, but is confined to the fibrous structure called the linea alba. This is spread out into a large lozenge-shaped area, bordered by the recti muscles. These muscles are separated, but not increased in breadth. The gravid uterus is thus slung, as it were, in a bandage between and by them. Examining, he finds that the maternal souffle is heard upon a curved line which corresponds to the course of the epigastric artery, which, in consequence of the mode of expansion already described, remains throughout at the same distance of ten centimetres from the spine of the ilium. Finding that the souffle is most distinct over the epigastric arteries, Glenard applied the crucial test of compressing the artery in the lower part of its course and succeeded in completely arresting the souffle. The proof seemed convincing, and Glenard confidently volunteered to demonstrate the truth of his assertions to the Académie de Médecine of Paris. In this, however, he signally failed, for he was utterly unable to affect the murmur by any compression he could exert on the epigastric arteries. Smarting under this failure, he fortunately succeeded in discovering another explanation of his former observations. Injecting the uterus of a woman who died three days after labor, he distended the arteries and found an artery as large as the brachial arising from the uterine artery and lying on the uterus almost exactly in the course of the epigastric. This artery he calls the puerperal artery, and believes it to be the location of the souffle.

Glenard's discovery still awaits confirmation, which can hardly be long in coming if it really is founded on fact. For my part, I believe that so large a vessel as the supposed "puerperal artery," if it really existed, would have been discovered years, nay, centuries ago, and that the explanation now generally accepted, that the uterine souffle has its seat in the large and tortuous uterine arteries, is sufficiently explicit. That

¹ Arch. de Tocologie, 1876.

a murmur may also originate in the venous sinuses of the uterus, and under certain circumstances in the large abdominal vessels, both veins and arteries, during the physiological chlorotic condition of the blood in pregnancy, seems by no means improbable. A relation of the murmur with the location of the placenta, applicable to the diagnosis of the seat of that organ (whence the old term "placental" souffle), is denied by all the advocates of this accepted theory, except Depaul. I myself have never been able to diagnose the seat of the placenta by the focus of the uterine souffle, except in so far as the audibility of the souffle also near the right horn of the uterus would lead me to suppose that the placenta was there inserted, a supposition which occasionally proved correct. But statistics by Gusserow, Martin, Bidder, and Schroeder show that the placental site is found almost with equal frequency on the anterior and on the posterior wall of the uterus, but that its lateral insertion is quite rare, only in about five per cent of the cases, the dextral insertion being twice as frequent as the sinistral. If the souffle depended upon and were loudest in the neighborhood of the placental site, it would, therefore, naturally in one-half the cases be most distinct near the median line, in the other half not at all or faintly audible, which, as we all know, is not the case, for it is most pronounced bilaterally where the uterine arteries are most tortuous. I can, therefore, agree neither with the old observations of Hohl, nor with those recently reported by Wilson, because they are at variance with my own and the experience of the majority of observers. Besides, as already stated by Scanzoni and Playfair, the murmur continues after the removal of the placenta. Practically, as a diagnostic sign of pregnancy, the souffle has lost in value since the observations of Velpeau, Depaul, Beau, Peaslee, Spencer Wells, and numerous others have shown that a murmur to all intents and purposes identical with it frequently occurs in large ovarian and fibroid tumors, the surface of which is covered with tortuous and dilated blood-vessels. In combination with the other well-known diagnostic signs it deserves consideration; alone it has but a supposititious value, and a too firm reliance on its puerperal character would be likely to lead to serious errors in the diagnosis of abdominal tumors. As a sign of the life of the fetus it is equally value-

less, for it continues after the death of the fetus, and even after the birth of the child.

Recently,¹ Rotter in Erlangen accidentally discovered that the uterine souffle is palpable, by detecting with the finger a distinct thrill in a circumference of 4-5 cm. around the umbilicus; this thrill was synchronous with the maternal pulse.

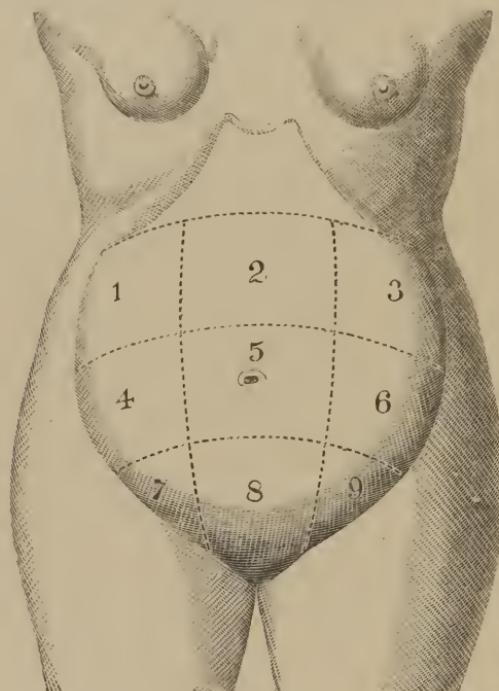


FIG. 5.

With the stethoscope a loud uterine souffle was heard at this spot. This observation was verified in eleven cases out of twenty in women near term. That the thrill proceeds from the uterine vessels, and not from the epigastric artery, is proved by the change of position of the thrill when the position of the uterus is altered, as when a woman assumes another posture; also by the fact that the vibrating tract of the uterine souffle crosses the course of the artery. A distinct thrill could be felt per vaginam corresponding to the external murmur in each lateral ascending branch of the uterine artery. The pal-

¹ Arch. f. Gynäkol., V., 1873.

pability of the uterine murmur had already been discovered by Rapin,¹ but was not corroborated.

CHART FOR EXTERNAL EXAMINATION OF OBSTETRIC CASES.

PALPATION.								AUSCULTATION.		PERCUS- SION.
BACK.	EXTREMITIES. LEGS.	ARMS.	BREECH.	HEAD.	FORE- HEAD.	CHIN.	FETAL HEART.	UTERINE MURMUR.		
Left. 3, 6, 9.	R. upper. 1.	—	L. upper. 3.	Either at or, later, just with- in pelvic brim.	Left. 9.	Right. 7.	L. lower. 9 to 6.	First mid- dle, 5, 8; later, 1, left, 9, 6.	Audible best at each lateral border of the abdomen, without regard to placental site.	
Right. 1, 4, 7.	L. upper. 3.	—	R. upper. 1.	Left and middle upper. 2, 3.	Right. 7.	Left. 9.	R. lower. 7 to 4.	First mid- dle, 5, 8; later, 1, lower, 4, 7.		
Left. 3, 6, 9.	R. upper. 1.	Sometimes centre.	Right and middle upper. 1, 2.	—	—	—	L. middle to up- per, 6, 3.	L. middle to upper 4, 1.		
Right. 1, 4, 7.	L. upper. 3.	5.	—	—	—	—	R. middle to upper 4, 1.	R. lower, 7, 8.		
Left. 3, 6, 9.	—	Occasion'ly right centre	—	L. upper. 2, 3.	—	—	L. lower. 8, 9.	Left lower, 8, 9.		
Right. 1, 4, 7.	—	4, 5.	—	R. upper. 1, 2.	—	—	R. lower, 7, 8.	Right lower, 7, 8.		
Lower and middle.	If palpable near centre.	—	R. lower. 7.	L. lower. 9.	—	—	—	—		
4, 5, 6, 7, 8, 9.	5 and 8.	—	L. lower. 9.	R. lower. 7.	—	—	—	—		
Not palpa- ble.	More frequently pal- pable near centre.	—	R. lower. 7.	L. lower. 9.	—	—	—	—		
—	5 and 8.	—	L. lower. 9.	R. lower. 7.	—	—	—	—		

II.

TREATMENT.

That the therapeutic application of external obstetric manipulation has attracted much greater attention than mere diagnostic palpation is apparent on referring to the number of authorities quoted in the historical portion of this paper.²

The majority of recent authors on obstetrics mention the sub-

¹ Schweiz. Corr. Bl., 2, 1873.

² I have not thought it necessary, in the Historical Sketch, to refer to and cite the opinions of all the numerous obstetric authors who have written on or devoted chapters in their works to this topic; the substance of their experience is embodied in the works of the recent writers from which I quote. Those who wish to collect *all* the literature of the subject of External Version from Genesis up, I refer to the excellent monograph of Dr. Noeggerath, in the New York *Journal of Medicine*, Nov., 1859.

ject at greater or lesser length, particularly Seanzoni,¹ Byford,² Barnes,³ Playfair,⁴ Spiegelberg,⁵ and Fritsch,⁶ the last of whom gives the best account of external version with which I have become acquainted.

Byford, speaking of external version, says: . . . "It is to be hoped that a persevering effort will be made by the practitioners of this country to educate themselves for this purpose, as there are so many good reasons why it is to be preferred to introducing the hand into the uterus."

Playfair, referring to the same operation, remarks: "In spite of the manifest advantages of the procedure and the extreme facility with which it can be accomplished in suitable cases, it has by no means become the established custom to trust to it, and probably most practitioners have never attempted it, even under the most favorable circumstances."

While nearly all authors recommend the manual expression of the placenta in all obstetric cases (Byford alone advises simple kneading of the uterus and the objectionable traction on the cord, without mentioning systematic expression), and this procedure is probably practised by the majority of educated obstetricians, the operation of external version is evidently still very much neglected. Indeed, as recently as in the spring of 1877, Dr. Leopold Ellinger, of Stuttgart (well known through his instrument for dilatation of the cervical canal), thought it worth his while again to advocate the more frequent employment of the measure by the relation of two cases of his own and one of Dr. Wolfgang Schmidt, of the same city, in which it was employed with marked success.⁷ The reasons for this neglect are to be sought, not so much in the want of appreciation of the measure by the profession, as in the peculiar difficulties attending its employment, difficulties emanating solely from the distaste of our ladies, who have not been educated or accustomed to being examined before labor, and which have already been referred to at the close of the historical part of this paper.

¹ Geburtshülfe, Bd. 3, 1867.

² Theory and Practice of Obstetrics, 1873.

³ Obstetric Operations, Am. Ed., 1876.

⁴ Midwifery, Am. Ed., 1878.

⁵ Geburtshülfe, 1878.

⁶ Klinik der geburtshülflichen Operationen, Halle, 1876.

⁷ AM. JOUR. OBST., April, 1877.

The various purposes for which external manipulations are employed in the treatment of obstetric cases are: *A.* The rectification of an existing malposition, or the conversion of one presentation into another more desirable one (transverse into head or breech, breech into head—external version; or face into vertex). *B.* The expression of the fetus. *C.* The expression of the placenta. These manipulations differ chiefly from those employed for a diagnostic object, in being useful or practicable only during the various stages of labor. To convert a transverse into a longitudinal position several months or weeks before labor is possible, to be sure, but a useless proceeding, in the face of the great mobility of the child and the chances it has of spontaneously assuming the usual vertex presentation.

A. RECTIFICATION OF AN EXISTING MALPOSITION OR PRESENTATION BY EXTERNAL MANIPULATION.

1. *Version.*

It seems scarcely necessary to point out the obvious advantage of a method by which the desired end is attained with equal facility over the ordinary operation of internal version—an operation which is usually not over-difficult nor dangerous, but which occasionally proves one of the most arduous in the whole obstetric list, and the mortality of which is estimated by Churchill, for the mother, as 1 in 16; for the infant, 1 in 3. Pinard gives even a higher rate—10 per cent of mothers, 50 per cent of children. If there are any means by which this frightful infantile mortality can be diminished, they should certainly be universally promulgated and adopted. Of course, we cannot expect to save every child, even though we turn it head downward by external version, for a large proportion of these children die from causes foreign to the operation, and acting upon them whatever position they may occupy; neither will it be possible to prevent the occasional death of the mother from some puerperal accident; but the operation of external version is so incalculably more simple, easy of execution, and less hazardous to the mother, that, in my opinion, some plans should be devised to popularize its employment.

The great objection to its frequent practice is the fact that only in very exceptional instances does the physician have the opportunity to see his patient before labor commences. He

is, therefore, generally unaware of the position occupied by the child, and when called to the labor usually finds the membranes ruptured, and the child so firmly grasped by the uterus as to render all efforts at external version futile. Further, as Fritsch truly says, the physician is frequently imbued with the prevalent opinion that external version is but a theoretical operation, and rarely productive of permanent benefit, and he, therefore, takes but little pains to accomplish his object, finding it easier and more time-saving for himself to wait until the os is dilated, perform internal podalic version and extraction, and rapidly pass on to the next patient, or return to his bed. Still another reason for its non-employment is the lack of dexterity of the physician in detecting the abnormal presentation by palpation—an often invaluable faculty at a time of labor, when the presenting shoulder, for instance, is not yet reachable by the vagina. The importance, therefore, of a thorough knowledge of abdominal palpation is at once apparent. The chief obstacle, however, to the frequent employment of the method lies in the neglect of physicians to assure themselves and their patients against avoidable accidents and the unpleasant occurrence of being taken unawares, by an examination, external and internal, made during the week preceding the expected day of confinement. In Germany, even the best families employ midwives, and the physician is called in only when that functionary happens to discover a malpresentation, or when operative interference is called for; thus are explained the statements of Ellinger¹ that several of his colleagues, in a large obstetric practice of twenty-five to fifty years, had each had occasion to perform external version but once, while he himself had never been afforded the opportunity until the cases arrived on which he bases his article. In this country and in England, however, where midwives are the exception and reputable physicians are generally engaged long beforehand for the expected confinement, nothing would be easier than to accustom the child-bearing portion of the community gradually to the inevitable external examination (supplemented, if then appearing necessary, by indagation) within a week or two of the approaching labor. Surely no woman who has been made acquainted with the importance of

¹ L. c.

this measure, and the benefit probably to be derived therefrom, will object to the innovation, and it will soon become a custom no more to be objected to than the usual indispensable vaginal examination during labor.

Referring to Pinard's recent work,¹ Tarnier made the following remarks at the Société de Médecine Publique, of Paris:² "Before long, both physicians and midwives will be obliged, under penalty of neglecting a duty, to inform themselves during the last months of gestation, whether the pregnancy is normal and nothing obtains prejudicial to a physiological confinement. The women, on the other hand, will soon learn of the existence of a simple and painless method of avoiding or relieving several possibly very grave accidents during parturition; and naturally they will seek to profit by it. These ideas will rapidly spread, and in the lower classes the women will gradually acquire the habit of going to the maternity hospitals during the last months of pregnancy, to ascertain whether the position of the child is normal, and they may look forward without fear to their delivery. A great progress will then be made, for the majority of obstetric operations will be avoided." The means for popularizing and properly utilizing the benefits of this operation have already been pointed out, and nowhere is the field more favorable for that purpose than in this country.

¹ *Traité du palper abdominal au point de vue obstétrical et de la version par manœuvres externes*, par A. Pinard, Prof. agrégé, etc. Paris, 1878.

² *Annales de Gynécol.*, Dec., 1878.

Although ordered fully six months ago, through some misunderstanding of the book agent, Pinard's work has not yet reached me. All I have seen of it, therefore, is the review in the *Annales de Gynécologie* referred to. So far as I can judge from this review, the book contains nothing new on the subject of obstetric palpation other than what has already been stated, or will still be mentioned in this article, excepting perhaps the employment of an obstetric bandage of original design to retain the replaced fetus in its normal position.

NOTE.—At the moment of going to press (March 20th, 1880), Pinard's book reaches me, kindly sent by the author himself. My above remarks are confirmed by its perusal. Of its 264 pages, the first 61 treat of the influences producing the various Positions and Presentations of the Fetus; the next 97 discuss very ably and fully the subject of Diagnostic Palpation; and the last 106 describe in detail the operation of External Version. Of these 106 pages, 40 are devoted to the relation of cases. The topics of Expression of Fetus and Placenta are entirely omitted.

It is well known that the mobility of the child in utero up to the hour of labor is exceedingly great, and that it will change its position, perform the *cublute*, as the French say, perhaps dozens of times during the last two months of gestation; even after labor has commenced has the presentation or position been known to change voluntarily. Although this excessive mobility is not the rule, and the head, when once well fixed above the pelvic brim, as it generally is by the seventh month, usually does not move until labor sets in, still the reverse so often happens, particularly in multiparae and women with lax utero-abdominal walls, the very cases which predispose to preternatural positions, that an attempt to permanently rectify the position before the actual inception of uterine contractions almost invariably proves futile. The presenting part usually slips away from the superior strait the moment the hand retaining it is removed, or the woman changes her position. Although some authors (Schroeder, Playfair, Scanzoni) speak of holding the head down by pads, bandages, and pillows until labor commences, none of them positively advise it, knowing very well the inefficiency of such passive mechanical means. And indeed it is quite unnecessary to undertake the operation at all before labor, because not only is it impossible to keep the child in the position to which it has been turned, but also will it frequently voluntarily assume the normal vertex presentation as term approaches—an observation which Fritsch mentions, and which I have myself made a number of times while conducting the "touch exercises" for students at Würzburg. Fritsch and Playfair nevertheless both advise the rectification of the abnormal position before the actual inception of labor, if it can be done without in the least injuring the mother, saying that it can do no harm, and should be recommended as an aid to Nature in her efforts to bring about a natural labor. Usually the manipulation will need to be repeated a number of times.

The operation of External Version is, therefore, essentially an operation advisable and beneficial only during labor, especially during the first stage of that act, before the discharge of the liquor amnii. To insure the easy performance of the measure, the utero-abdominal walls should be lax, the fetal position readily palpable, the liquor amnii present, and the

fetus easily movable. Still the operation has occasionally succeeded after the rupture of the membranes, and should always be attempted when the uterine walls are lax. Fritsch reports successes of this kind, and I myself remember one instance in which I succeeded in turning the child on the feet by external manipulation twelve hours after the discharge of the waters. In this case, I held down the breech with one hand, passed two fingers of the other into the vagina, seized the feet and extracted the child. The size of the child will materially influence the practicability of this manoeuvre, which, of course, will more easily succeed with a small than a large child. But the child must be living and possess the requisite amount of resistance; if the child be dead, it is easier to turn a large than a small child.

One paramount advantage of version by external manipulation is the rectification of a malposition without the always more or less hazardous passage of the whole hand into the uterus. Whenever we can avoid the possible injury of the endometrium, or the introduction of septic matter into the uterus, we should always do so, if another method presents itself for attaining our object. Another scarcely less important advantage is the conversion of the transverse position into a *cephalic* presentation (internal version being generally, from necessity, podalic), that is, changing a position in which a mature, living fetus can ordinarily not be born, into a natural one. Not only the safety of the mother, but also that of the child, is, therefore, enhanced by external version.

As by internal manipulation, so may the position be changed by external version to a head or breech. Practically, cephalic version is, as a rule, the only one to be advised in the cases in which external version is feasible, for the reason that we wish to bring about a normal position and a natural labor, and that in such cases there is no necessity for hastening delivery.

Whenever delivery should be rapidly effected, we would not trust to the efforts of nature, but perform internal podalic version and extraction at once.

Indications.—Whenever during the last month of gestation, or during labor before the rupture of the membranes and fixation of the presenting part, examination reveals a transverse position of the fetus, the attempt should be made to convert

the abnormal position into one of the head by external manipulation. Should palpation show that, even after the discharge of the liquor amnii, the child is but loosely grasped by the uterine walls, a like endeavor should be made. The trial can do no possible damage, if carefully employed, and may succeed even hours after the evacuation of the waters. During gestation the measure will usually be futile, the fetus soon resuming its abnormal position; in that case it should be repeated, and particular directions left by the physician that he be sent for at the first sign of labor. As it occasionally happens that the membranes rupture unexpectedly before noticeable pains have occurred and before the os is dilated, it is advisable to caution the patient to send for her physician as soon as either pains set in or water comes away. By not anticipating such an occurrence, and therefore omitting to give other directions than to be sent for when pains came on, it happened to me several years ago that I was not sent for until twelve hours after the waters had burst, when the first distinct pains showed themselves. In consequence, I found the child closely wrapped in the uterus, all the liquor amnii drained away, external version impossible, and myself compelled to perform a very difficult internal version.

Following in the lead of Mattei and Hegar, Pinard¹ has recommended the conversion of every breech into a head presentation by external version. Although his view is not shared by the majority of writers, it is in my opinion unquestionably good practice to endeavor to avoid the anxiety to mother and physician, and the danger to the child always accompanying a presentation of the inferior extremity (collection of various authors, mortality of mothers, 3 per cent; children, 22 per cent), whenever the presentation is detected sufficiently late in pregnancy or early in labor to render its conversion into a head presentation useful or practicable. That it is likely to be rather more difficult than in a transverse position should not deter us from making the attempt. The breech once fixed in the pelvic brim, or the liquor amnii discharged, there will be very little prospect of our being able to dislodge and press up the presenting part. Those cases in which the head, in transverse positions, shows a spontaneous tendency to glide toward the

¹ L. c.

pelvic brim—oblique positions; or the presenting breech rests on the ilio-pectineal line; or the feet present, instead of the breech; or there is an abundance of liquor amnii, will prove specially favorable for external version, as is also the case with a second twin child. Cases of contracted pelvis of a moderate degree form an exception to the rule of cephalic version. In these cases it is generally considered safer to turn on the breech or feet, as it has been demonstrated that an after-coming head, being shaped like a wedge, will usually pass through a narrow pelvis more readily than the broad vertex of a presenting head.

Counterindications.—The only actual counterindication to the *attempt* of external version is the necessity of a rapid termination of the labor. Tenderness, thickness or tension of the abdominal walls, the small amount or discharge of the liquor amnii, fixation of the presenting part, unusual size or death of the child, are not properly counterindications to the *attempt*, but rather obstacles to the *success* of the operation, which *may* occasionally be overcome.

That I do not consider a breech presentation a counterindication to external cephalic version, whenever the version can be safely performed, I have already stated.

Operation.—An accurate knowledge of the exact position of the child is absolutely indispensable to the rational performance of external version. This knowledge can be best, and often only, acquired by palpation and auscultation, as described in Part I. In transverse positions, indagation, at the time external version is feasible, usually shows us merely the absence of a presenting part, but does not tell us on which side the head lies or whether the presentation is oblique or transverse. As already stated, the operation may be performed at any time during the last month of pregnancy, and during labor, so long as the child is not too firmly grasped by the uterine walls. But the time of election for the operation is during the first stage of labor, before the membranes have ruptured, and when the os uteri is approaching complete dilatation.

The physician having diagnosed the position of the child, and ascertained particularly the whereabouts of its head and breech, proceeds to perform version in the following manner: The woman being placed in the position on her back employed for

palpation (see p. 20), with empty bladder and rectum, the operator stands at her side (choosing preferably the side on which the breech is situated, in order to secure the greatest amount of purchase on the two fetal extremities), and placing one open hand on the abdomen over the head of the child, the other over the breech, grasps them gently, but firmly, and endeavors by a sliding, pushing motion to direct them toward the desired point, the head downward, the breech upward. In doing so, he will usually be obliged to press deeply into the abdomino-

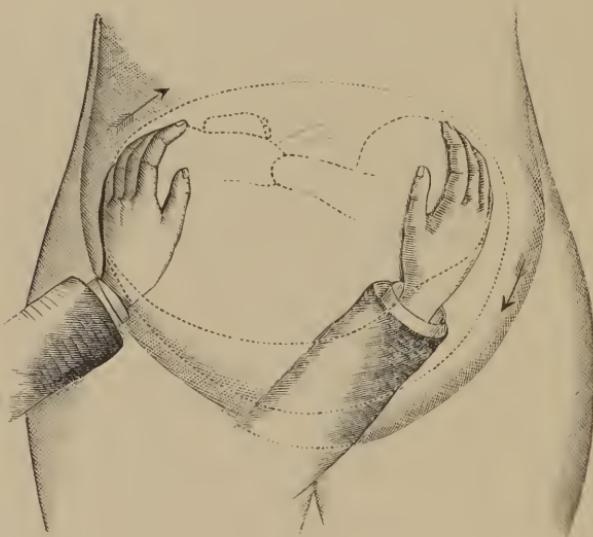


FIG. 6.

uterine wall and, as it were, push it in the desired direction. Frequently, deep frictions in opposite directions over the head and breech are required to dislodge the parts and help change the shape of the uterine cavity to the normal longitudinal ovoid. Thus, if the presentation is a I. transverse, 1st subdivision, the head in the left iliac fossa, the operator stands on the right side of the patient, places his right hand over the head of the fetus, his left over the breech, and while he pushes the breech up toward the fundus, presses the head down into the pelvic brim. If labor have already commenced, of course this is done only between the pains, during which the hands hold the two fetal antipodes firmly fixed in whatever position

they may have been moved. The pains themselves, by contracting the uterine walls around the child, aid in correcting and fixing the position, when once rectification has begun. It is very probable, as Fritsch says, that at first the whole uterus is pushed up with the breech, while the head seeks a central support in the brim of the pelvis; as soon as this is gained, the force is transmitted to the breech, which then assumes its normal antipodal position at the fundus. These manipulations must be continued until either the purpose is obtained, or its impracticability demonstrated. Occasionally an attempt made at one period fails, and after an interval succeeds.

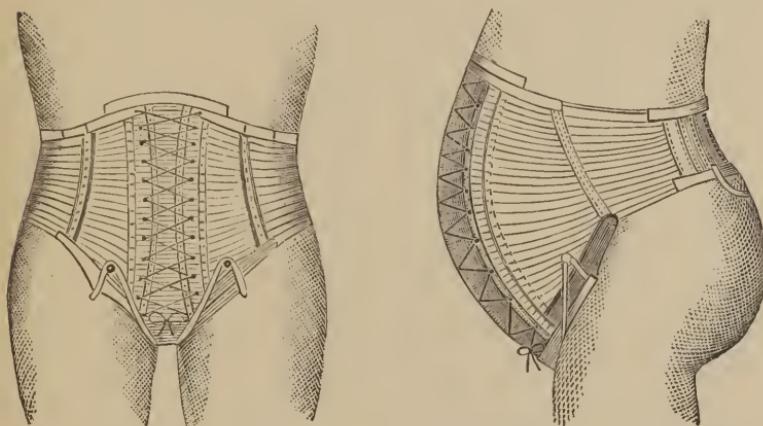


FIG. 7.—Pinard's bandage for corrected mal-presentation.

When the rectification of the position has been confirmed by a vaginal examination (during which the head is firmly held down by the hand of an assistant) and the head is felt in the pelvic brim, the woman is directed to lie on the side where the head formerly was, and a firm pillow may be applied over the ilio-lumbar region on that side, to prevent the head from again slipping into the iliac fossa. Pinard in his recent work recommends a peculiarly padded abdominal bandage for this purpose, and claims to have secured the retention of the head in the pelvic brim by this means, even when the woman was up and about. In the review of Pinard's book already referred to, I find it stated that he rectifies the position as early as the eighth month, and at once applies his bandage, even though the head be still above the brim. It is spoken of as "une sorte de

ceinture" (Fig. 7). The pressure by it is gradually increased, and when the head is fixed, it may be removed. It is said to give no inconvenience, and the theoretical objection advanced by Tarnier, that the compression exerted by it might predispose to eclampsia, is disproved by Pinard himself and the reviewer, Thévenot, who sought for albumen in the urine of several women who had worn the bandage from twelve to fourteen days, and found no trace of it. The efficiency of the supporter was demonstrated by Pinard in twenty-six cases.

I certainly have found cushions and pillows ineffectual, unless the proper lateral decubitus was employed at the same time; and even then the head required to be pushed down repeatedly and held there before I could be sure of its fixation by the pains. Ellinger¹ doubtless gives the most effectual means of keeping the head down, when he insists on its being held by the hand of an assistant until the uterine contractions force it into the pelvic brim, or the membranes rupture, or the os is sufficiently dilated to allow of their being ruptured; such an assistant can be found in any intelligent person, the husband, nurse, or female friend; all that is required being simply to exert steady downward pressure over the hypogastric region. Of course, his remarks apply only to the first stage of labor. When the os is sufficiently dilated, that is, at least one-half, the best means of fixing the head permanently are to rupture the membranes. Until the head has become firmly engaged in the pelvic cavity, the woman should occupy the lateral decubitus, as above stated, on the side where the head formerly was. To avoid possible prolapse of the funis, the membranes should be ruptured during the interval between the pains, and the head then fixed by exiting uterine contractions by frictions of the fundus, or, in default of these, by steady downward pressure on the breech of the child. Once fixed, the woman assumes the lateral decubitus corresponding to the occiput of the child. Occasionally, in cases of extreme mobility of the fetus, and in oblique positions, the same lateral decubitus may alone succeed in restoring the longitudinal position of the child. Fritsch² mentions a case where he saw a first face presentation (forehead left) change voluntarily to, and the child born in, an L. O. A. presentation, when the woman was laid on her left side.

¹ L. c.

² L. c., p. 154.

The conversion of a breech into a head presentation differs only from that described, in that it may be necessary to lift the breech out of the pelvic brim with one hand, before the head and shoulders will yield to the downward pressure of the other hand.

Podalic version by external manipulation can be indicated only in cases where the child is very movable, the os but very slightly dilated, and the inferior extremity lower in the uterine cavity than the head, the membranes being intact or not; such cases are, particularly, the early stages of placenta previa, when it may be desirable or imperative to use the thighs and breech of the child as a hemostatic or wedge. It is this class of cases to which the Wright-Braxton Hicks method is peculiarly applicable.¹

The version once completed, the labor is conducted on precisely the same principles as those governing an ordinary presentation of the kind.

2. Conversion of a Face into a Vertex Presentation.

From Osiander and Baudelocque down, various obstetric authors (chiefly Cazeaux and Hodge) have recommended the conversion of face into vertex presentation by internal manipulations, passing two or more fingers into the cervix after rupture of the membranes, and first pushing up the chin, and then rapidly grasping and drawing down the occiput. While recent writers, of such prominence as Scanzoni and Schroeder, do not mention this manoeuvre at all, others, like Barnes, refer only to acting on the chin as a fulcrum, with two fingers in the cervix during the pains, in order to secure a depression of the vertex; and others again, like Playfair, Leishman, and Spiegelberg, while briefly enumerating the intrauterine manipulations above referred to, express doubts as to their facility and safety, and think that (with the exception of the early stage in very favorable cases) internal podalic version would be scarcely more difficult and hurtful, and a decidedly more certain means of delivery. While the older authors started from the idea that face presentations were in themselves dangerous, and should

¹ I do not describe this method here, because I have briefly pointed out its features in the historical sketch in Part I., and because, being a combined manoeuvre, it really is not in the scope of this paper.

always be converted into vertex, all modern obstetricians are fully aware that, as in breech, so may a living child be readily born in a face presentation, by the unaided efforts of Nature. But statistics show us that, while in vertex presentations 5 per cent of the children, and scarcely $\frac{1}{2}$ per cent of mothers die (Pinard says, only 2 per cent of children, and $\frac{1}{3}$ per cent of mothers), in face presentations the mortality runs as high as 13 per cent of children and 6 per cent of mothers.¹ Evidently, the length of the labor, the pressure on the head and neck of the child and the soft parts of the mother, exert their evil influence on both, not to speak of the defects of rotation and extension (chin backwards; and brow presentations), and consequently instrumental deliveries frequently occur in these cases.

To diminish this mortality, and at the same time avoid the injurious and often ineffectual internal manipulations recommended for the purpose, the ingenious brain of Prof. Schatz, of Rostock, has devised a method of correcting the presentation by purely external efforts,² a method of which Spiegelberg, in his recent excellent work on Obstetrics, says: "The only reliable plan of rectifying a face presentation is that by external manipulations, as described by Schatz, which is well worth consideration."

Schatz says *verbatim*: "The conversion of a face to a vertex presentation, by purely external manipulations, should be undertaken chiefly in the first stage of labor (exceptionally, perhaps, also during pregnancy), and is intended to avoid the dangers of face presentations, without incurring inconvenience or danger to mother and child."

The method is as follows: Above all, the operator must be proficient in external obstetric examination, and be able to diagnose easily and positively every projecting portion of the child, and recognize the face presentation by its protruding hard forehead on one side, and the broad resistance of breast and soft projection of shoulder on the other (see Part I., p. 39). In the interval between the pains, the operator seizes the shoulder and breast of the child with one hand, and pushes both upwards and to the side where the back lies (Fig. 8, *i. e.*, the same side towards which the brow points, left in I., right in II. presentation); as soon as breast and shoulder have been brought

¹ Winckel: *Pathologie der Geburt*, 1869. ² Arch. für Gyn., 5, 1873.

into the long axis of the fetus, the pressure is directed no longer upwards, but towards the back of the child (Fig. 9), at the same time the other hand firmly grasps the fundus uteri with the breech, and pushes it towards the side to which the thorax points; but care must be taken not to antagonize the direction of the first hand, but rather press perpendicularly towards it (Fig. 9); and later, when the shoulder is in the long fetal ovoid, parallel to it, but in the opposite direction. Then the pressure of the second hand should be directed laterally and downwards, or directly downwards (Fig. 10), in order to remove the thorax and shoulder as far as possible from the long fetal axis to the side where the back lies. Thus, in the pre-

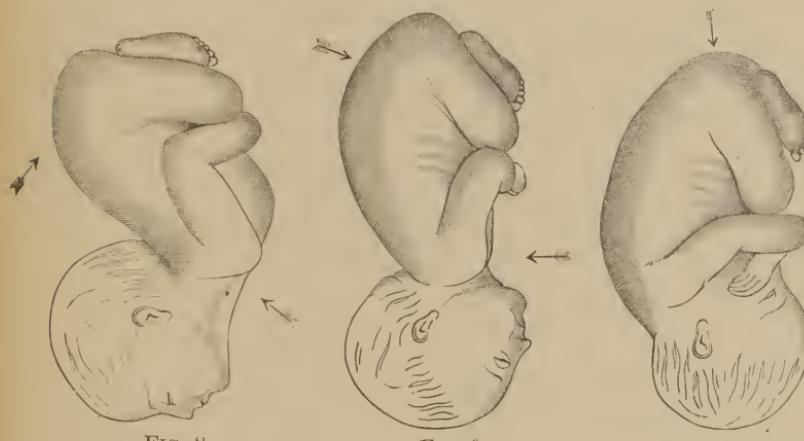


FIG. 8.

FIG. 9.

FIG. 10.

sentation shown by the diagrams, the II. face, the shoulder and thorax are first pushed upwards and to the right, then to the right; then with the left hand the breech is pushed to the left and downwards, and finally straight downwards. In case the brow should again seek to slip upwards on the (in this case, right) ilio-pectineal line, the hand of an assistant must supply the left lateral pelvic wall, and by pressure prevent this evasion. The accompanying three diagrams, taken from Schatz's article, will illustrate the mechanism of each step of this maneuvre.

The great advantage of this method is, that it can be undertaken before the rupture of the membranes, while the face is still at the brim; and that, if it fails, it has at all events done no damage. Schatz relates, in detail, one case in which this

theoretically devised plan succeeded perfectly. Fritsch¹ reports another instance in which an attempt at conversion of a second face into a vertex presentation by external and internal manipulations after the rupture of the membranes failed; but a second attempt by the external method of Schatz succeeded completely. A slight aid which he gave to the rotation with a finger of the other hand in the cervix, Fritsch thinks not essential to the success of the operation, and cites the case as an evidence of its utility, even in difficult cases; he thinks it should be practised more frequently. One great obstacle is tension or obesity of the abdominal walls. Welponer, assistant to Prof. Carl Braun, reports² a third case (so far as I know, these are the only three published) of a primipara with a justo-minor pelvis, in which a l. face presentation was at the fourth attempt rapidly changed to a L. O. A. position, the membranes rupturing at the same moment. The child was born spontaneously five hours later in a R. O. A. position, the head having rotated.

Having no experience with this method, I give it on the representation of such reliable obstetricians as Schatz, Fritsch, and Welponer, believing that it is not familiar to the profession in this country.

B. THE EXPRESSION OF THE FETUS.

It has already been mentioned, in the historical part of this paper, that manual expression of the child was known to the ancient Romans, the Arabians, and the obstetricians of the middle ages. But after the sixteenth century it appeared to have fallen into disuse with civilized nations. Among semi-civilized and savage peoples, however, it constituted and still constitutes the chief active interference employed. Thus, among the Japanese, Siamese, American Indians (Diggers³), Mexican Indians, Kalmucks, methodical external pressure by means of the arms or bandages, or kneading the abdomen with the hand, sitting on it, or even treading on it with the naked feet (Mexicans), is still in common use.

From time immemorial, friction of the abdominal parietes during tedious labor has been employed as a stimulant to

¹ L. c., p. 157.

² Arch. f. Gyn., XI., 2.

³ Bost. Gyn. Soc. Trans., 1870, Vol. III.

the regular uterine contractions, and has proved itself a safe and efficient auxiliary, safer and more prompt than ergot or other oxytocics, and more effectual than the hot bath, cold sponging, or active motion. It is a practice familiar to every nurse or midwife, and probably made use of to a greater or lesser degree in the majority of labors. It is particularly useful and effective at the close of the labor, etc. By exciting or increasing uterine contractions, the normal expulsive force of the uterus is increased, and abdominal friction, therefore, must be considered merely as an oxytocic, a promoter of the natural expulsive power of the uterus. *Expression* of the whole or part of the fetus is, however, a totally different thing. It was designed by its advocates to entirely supply the place of uterine contractions, the fetus being literally pressed out of a passive uterus by manual pressure alone. Besides, its use was to be extended to intensifying feeble contractions by the rhythmic compression of the fundus uteri, in which capacity it acts precisely like the frictions mentioned above.

The first to revive the practice of propelling the child by manual pressure was Ritgen,¹ of Giessen, who, in a paper entitled "Delivery by Pressure instead of Traction," based entirely on theoretical reasoning, put and answered the very pertinent question, "Why do we always drag, and never push, out the fetus?" by arguing that the force exerted by Nature in the expulsion of the child is one of expression, a *vis a tergo*, while that employed in the universal means of instrumental delivery, the forceps, is a *vis a fronte*, therefore contrary to Nature. On the strength of this reasoning he recommended that the fetus be expelled by pressure on its upper extremity through the abdomino-uterine walls. Nothing came of this advice, however, until Kristeller,² of Berlin, in 1867, reported a series of cases in which, by systematic rhythmical pressure on the fundus uteri, he had succeeded in effecting the delivery of the child.

By means of a dynamometric forceps of his own invention, he demonstrated that the force necessary to extract a head that has lain immovable for hours is often not more than 5-8

¹ Von Ritgen, "Ueber das Entbinden durch Druck, statt Zug," Monats-schr. f. Geb., 8, 1856.

² Berl. Klin. Wochenschr., No. 6, 1867, and Mon. f. Geb., 29.

pounds, and concluded therefrom that the force required to express the same head could not be very great. According to Poppel's¹ previous experiments, the force needed to effect an easy delivery does not exceed four pounds. The propulsive force necessary to expel a child must equal its weight; adding about the same amount for friction, an estimate can thus be had of the average amount of force required to express a child from the uterus, *i. e.*, about twenty pounds. Kristeller did not restrict his method to head presentations, but used it to expedite the delivery of the shoulders after expulsion of the head, of the breech or shoulders and head in head-last labors, and to aid the forceps or hands in extraction.

The thoroughness of Kristeller's article, and the explicit directions based on practical experience given by him for the performance of the operation, induced numerous obstetricians to give it a trial, and commendatory reports by Ploss,² Abegg,³ and Playfair⁴ soon appeared in the journals. In the last edition of his text-book,⁵ Playfair still expresses himself very favorably of the operation, and says that "its effects are often very remarkable, especially in women of slight build, where there is but little adipose tissue in the abdominal walls, and not much resistance in the pelvic tissues." Schroeder,⁶ Barnes,⁷ and Spiegelberg⁸ approve of the method, and admit its efficiency in many cases where the forceps are commonly used, and particularly in head-last labors.

Within the past year a new advocate for expression in head presentations has arisen in the person of Prof. Bidder, of St. Petersburg, who reports⁹ 81 cases in which he employed it successfully. As regards puerperal convalescence, its results surpassed those obtained in simple, uncomplicated forceps deliveries. Of the 81 women delivered by expression, 34 made a perfectly normal convalescence, 38 showed slight deviations from normality, 7 were very ill, and 2 died. Of 75 simple forceps cases (the head being low down in all), 13 made a normal convalescence, 34 were slightly ill, 20 seriously, and 8 died. Prof. Bidder advises the method to be used as soon as the

¹ Mon. f. Geb., 1863.

² Zeitschr. f. Med. Chir. u. Geb., 1867. ⁶ Lehrb. d. Geb., 1876.

³ Zur. Geb. u. Gyn., Berlin, 1868. ⁷ Obstetric Operations, 3d ed., 1876.

⁴ Lancet, 1870.

⁸ Lehrb. d. Geb., 1878.

⁵ Midwifery, 2d ed., 1878.

⁹ Zeitschr. f. Geb. u. Gyn., III., 2, 1879.

membranes are ruptured and the head has engaged in the dilated os. He thinks it less liable to cause inflammatory or septicemic trouble than the forceps, as it produces less local injury. He considers that the method has fallen into disrepute merely because it has not been properly employed.

As already stated, the manual expression of the fetus attains its object in two ways: 1. Direct compression of the uterine cavity; 2. Excitation of uterine contractions. The first of these means is analogous to the natural compression of the uterus by the abdominal muscles during labor, the so-called "bearing-down," and supplies the place of this factor in delivery. The efficacy of this auxiliary during the closing phases of the second or expulsive stage of labor is familiar to all who have ever intelligently assisted at a labor. Another effect of muscular, and therefore also of manual, pressure is the rectification of the usual dextral inclination of the uterus, whereby the presenting part is brought more into the axis of the pelvic canal and its mechanism facilitated.

Advantages and Indications.—Kristeller claims the following advantages for fetal expression: 1. It shortens the duration of labor; 2. The normal position of the child is preserved; 3. The application of the forceps is frequently rendered unnecessary; 4. It thereby aids in protecting the perineum; 5. It facilitates and hastens the nevertheless often necessary forceps delivery; 6. It prevents the upward extension of the arms in breech deliveries; 7. It hastens the expulsion of the shoulders after birth of the head.

Indispensable conditions for the method are: 1. A vertical position of the child, either in head or breech presentation; and, 2. The absence of any inflammatory affection or unusual hyperesthesia of the abdomen; 3. No sign of a twin pregnancy.

The *indications*, according to the authors of the method, are: 1. To expel the ovum in abortion; 2. The induction of premature labor; 3. In molar pregnancy; 4. The necessity of a rapid termination of the labor, even though the pains be good, as in placenta previa; 5. Weak or deficient labor pains, in normal pelvis, up to the expulsion of the shoulders; 6. As an aid to the delivery of the head in head-last cases, together with podalic extraction; 7. As an aid to the delivery of the head in forceps cases.

Of these indications, the second and fifth seem to us rather problematical: there are certainly better, quicker, and less painful methods of inducing premature labor than by the systematic persistent compression of the uterus; and if we need to complete delivery so rapidly as frequently becomes necessary in placenta previa, we would scarcely resort to the always more or less tedious and uncertain measure of manual expression of the child, unless indeed the membranes be ruptured and the os uteri so widely dilated as to permit the presenting part to be pushed through it, and thus act as an immediate hemostatic. Indication 1 will also be found doubtful, inasmuch as but few women will bear the amount of pressure required to squeeze an ovum, or part of one, out of the uterus; at least those women on whom I have tried it, objected very decidedly to its continuance. The same holds good for molar pregnancy, although the larger the uterine cavity, and therefore the thinner its walls, the easier will their compression and the expression of their contents usually be. With the ardor of an inventor, Kristeller has, of course, endeavored to extend the limits of his method as far as possible, and has sought to apply it as a rule in cases where its success would be a rare exception. He found an enthusiastic follower in Dr. Abegg, Sanitary Councillor in Danzig, who writes¹: "What the bimanual method of Braxton Hicks is for abnormal presentations, that is Kristeller's operation for natural positions—the safest, most efficient, most natural, and therefore most rational."

The three last indications, on the other hand, admit of no dispute. I will discuss them separately:

Indication 5, Weak or deficient Labor Pains. Playfair says: "It is not, however, as replacing absent pains, but as a means of intensifying and prolonging the effects of deficient and feeble ones, that pressure finds its best application. . . . The cases suitable for its application are those in which the head or breech is in the pelvic cavity, and the delay is simply due to a want of sufficiently strong expulsive action." Barnes and Schroeder express substantially the same opinion.

That steady pressure on the fundus uteri will, when the os is thoroughly dilated, advance the presenting part toward the floor and outlet of the pelvis can readily be demonstrated in

¹ L. c.

any suitable case; to be sure, the presenting part recedes when the pressure ceases, but with each succeeding pressure the advance will be slightly greater, until, everything being favorable, the vulva is distended and the part expelled. Besides the indispensable conditions to the success of expression mentioned above (vertical position of child and absence of abdominal tenderness), there are four other conditions which are quite as essential, viz.: a normally shaped pelvic canal, a well dilated os uteri, a ruptured bag of waters, and, finally, a low position of the presenting part.

Partial dilatation of the os and the persistence of the membranes will not absolutely contraindicate the operation; but, to be effectual in such cases, it would have to be continued so long as to become exceedingly painful to the patient and exhausting to the operator.

All authors agree that the cases particularly suitable to Kristeller's method are those in which the presenting part rests on the floor of the pelvis or even presses against the perineum, and for want of efficient pains does not advance, or advances but to recede. A very large percentage of primiparous labors belong to this category. In these cases, there are but two other means left to the medical attendant—the production of a *vis a tergo* by internal oxytocics, notably ergot (the well-known dangers of which should *absolutely* prohibit its use at any time between the rupture of the membranes and the birth of the presenting part), and the forceps. It is in these cases that the so-called "pocket" forceps, so much lauded by many physicians, come into play, and with one or two gentle tractions overcome the obstacle. In such cases Kristeller claims, and, no doubt, justly, for he is supported by eminent authority, that three or four, or more, intermittent, firm, downward compressions of the body of the uterus will accomplish the expulsion of the head and shoulders; and that this is accomplished without special pain or discomfort to the mother. Playfair and Abegg both report precisely such cases, and the former says that, out of the large number of cases in which he has used it, he has never seen one in which it proved hurtful.

In breech presentations I believe the method to be vastly more valuable than in head labors, and I refer particularly to cases in which the breech becomes impacted in the pelvis in

such a manner that extraction by fingers or instruments is a matter of impossibility or great difficulty. Here the forceps have been applied successfully, but their introduction is frequently hazardous, and their grasp often an insecure one. If now by expression we can succeed in reaching the flexure of the thigh, the extraction becomes like any ordinary one.

The advantages claimed by Kristeller for his method are not to be denied, to a certain extent; but as regards the range of application of expression, I think he goes decidedly too far. When his paper appeared, I had abundant opportunity to test the method, and found it both painful to the woman and fatiguing to myself, in all cases where the head did not rest directly on the perineum. While I have very frequently expressed the head so situated with but little trouble, as, of course, every experienced accoucheur has done, I confess I should much rather give a few whiffs of chloroform and extract the head with a half-dozen easy forceps-tractions, than endeavor to express it when it is still situated in the cavity of the pelvis. The typical cases for expression are those, so frequently met with in primiparæ, in which with each light pain the presenting part bulges forward the perineum and perhaps distends the vulva, only to recede again and again, until after several hours of this delay the woman becomes exhausted and demands relief. With the breech and after-coming head the matter is quite different. Still I am disposed to agree substantially with the rule laid down by Abegg, that "whenever there is delay in the expulsion of the head, Kristeller's expression should be tried, before applying the forceps." Should it fail, it will at all events serve to push the head deeper and fix it more firmly in the pelvic cavity, and thus facilitate its extraction with forceps.

The Counterindications to manual expression have already been referred to in the preceding section; they may briefly be enumerated as follows: Fetal position other than head or breech; imperfect dilatation of os; persistence of membranes; high stand of presenting part; contracted pelvis, except expression of after-coming head in the minor degrees; inflammation or hyperesthesia of utero-abdominal tissues; unusual tension or obesity of abdominal wall; necessity for rapid delivery.

Indication 6. Expression as an aid to the delivery by manual extraction of the head in head-last cases. The expres-

sion of the head during its delivery by manual traction on the body has been in use since the introduction of podalic version and extraction, and was recommended by Celsus at the time of Augustus, and after the revival of obstetric medicine from the abyss of the middle ages, by Paré (1560), later by Pugh (1753), and Wigand (1800), and in our own time by C. Braun, E. Martin, and all writers on obstetrics. It is a measure of the greatest utility and importance, and may enable us both to avoid the forceps (always a difficult and often an unsuccessful operation in the haste of the moment), and save the life of the child at the critical period when its cord is being compressed between the impacted head and the pelvic brim.

The valuable influence of expression as an aid to the delivery of the breech and body of the fetus has already been pointed out. Kristeller reports a case in which he expressed the shoulders and head (the rest of the body having already been born) by five compressions in two minutes. But Schroeder very properly remarks that this could have been done by traction in the ordinary manner in one-half a minute, and that sole reliance should, therefore, not be placed on expression. It is as an aid to the passage of the after-coming head through the pelvis that it is of the greatest value, particularly in cases where there are no uterine contractions whatever, and especially where there is a disproportion of minor degree between the head and pelvic canal. In this latter class of cases, moderate pelvic contraction, the method has recently again found an able and enthusiastic advocate in Dr. William Goodell, of Philadelphia, who in a paper on "Turning in Pelves Narrowed in the Conjugate Diameter,"¹ relates a number of cases in which the greatest assistance was rendered in the manual extraction of the head by suprapubic pressure exerted by the hands of an assistant, the children being extracted alive. In one case, the true conjugate measured 2.82 inches, and the child weighed 8 lbs. 6 oz. In another case the c. v. measured between 3 and 3½ inches, and the child weighed 5 lbs. 6 oz. Another, c. v. 3.32 inches, child 7 lbs. 10 oz., and so on. Dr. Goodell sums up his experience by saying that "by the conjoint use of two very nearly equal forces, viz., that of suprapubic pressure by the hands of an assistant, and that of traction on the body of the child by

¹ AM. JOUR. OBST., VIII., 1875-6.

the physician, there can be safely brought to bear upon the hind-coming head an extractive force fully as great as that by the forceps on the fore-coming head. Thus in case VIII., Dr. Roberts and myself together exerted a force of certainly not less than 200 pounds. In case IX., Dr. J. F. Wilson's *vis a tergo* and my *vis a fronte* must, unitedly, have equalled fully 150 pounds. For want of a better place, let me here say that the supra-pubic pressure possesses another helpful property besides that of propulsion. If directed downward and backward, as it should be, it flattens the head literally against the sharp edge of the promontory, and aids in the process of moulding."

The immense value of expression is shown by these statements of so exact and reliable an observer as Dr. Goodell; another advantage, also mentioned by him, is the possibility of directing the head so that its largest diameter enters into the largest part of the contracted pelvis, that is, the broad occiput into the lateral portion of the pelvis, and the small bitemporal diameter into the narrow conjugate.

This suprapubic pressure may be exerted with considerable force; but there is a limit to this, for, aside from a possible injury to the soft parts of the mother, the child's head may be so firmly compressed against the pelvic brim as to cause contusion and fracture of the skull and intracranial effusion. I have a recollection of seeing a case reported of fracture of the skull produced in this manner (I forgot the journal), and one lately of intermeningeal apoplexy, occurring in a labor with contracted pelvis (3 inches conj. vera).¹

Indication 7. Expression as an aid to the delivery of the head in forceps cases.—It is an established rule in forceps extractions to make traction only during the pains, if, indeed, there be any present. The reason for this is obvious, viz., to secure the *vis a tergo* force of the uterine contraction, as an aid to the *vis a fronte* force of the forceps. Precisely what is done by the contractions, it is designed to do by methodical pressure on the fundus uteri, when they are absent or deficient; and it is advisable to exercise the pressure even when the pains are active.

¹ Kucher: The Forceps to the After-coming Head. Wiener Med. Wo-chenschr., Aug. 9th, 1879.

A most efficient method for preserving the perineum in primiparae, to be recommended in all such forceps cases where a delay of ten to fifteen minutes in delivery is not counter-indicated, is to remove the forceps as soon as the occiput protrudes under the pubic arch, apply expression until the chin can be reached by the fingers in the rectum; and then gently and gradually aid the extension of the head, until the face slips over the fourchette. This manoeuvre may occupy fifteen minutes or longer, and beginners are particularly cautioned not to hasten the process, and to exert only the very gentlest traction on the chin with the intra-rectal fingers, while supporting and even repelling the occiput with the other hand, until the perineum is thoroughly distended.

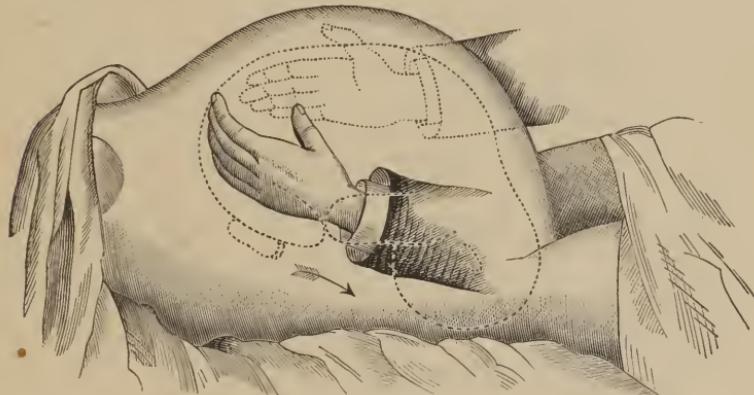


FIG. 11.

After what has been said in the previous section, it is evident that supra-pubic pressure in the rare cases of forceps extraction of an after-coming head is of even greater importance than in the case of the presenting head.¹

Operation.—Kristeller describes it as follows:² “The patient being in the dorsal position, the operator maps out the uterus and

¹ Schroeder in his *Obstetrics*, and Kucher (l. c.) both proscribe the use of the forceps in head-last cases as unnecessary and dangerous, since manual extraction (by the methods of Veit, Smellie, Prague) is perfectly competent to extract any head that will pass uncrushed through the pelvis. I think this condemnation too sweeping; and certainly have saved the lives of several children with the forceps so applied. It is chiefly indicated in a moderately contracted brim.

² Abegg, l. c.

moves it into the axis of the pelvic brim, if it should have deviated to one or the other side. He then grasps the uteruses with both hands on the same plane, with their ulnar border directed toward the pelvis, the palm pressing on the fundus or the sides near by, the thumb pointed toward the median line, and the fingers striving to encompass the uterus as much as possible. First the abdominal walls are gently rubbed against the uteruses, and then, the hands retaining their position, slight, gradually increasing downward pressure is made, which is kept up for a time at its acme, and then gradually diminished. The pressure should last five to eight seconds, and be repeated at intervals of one-half, one, or three minutes, according to the stage of labor and the sensitiveness of the patient. The points of pressure

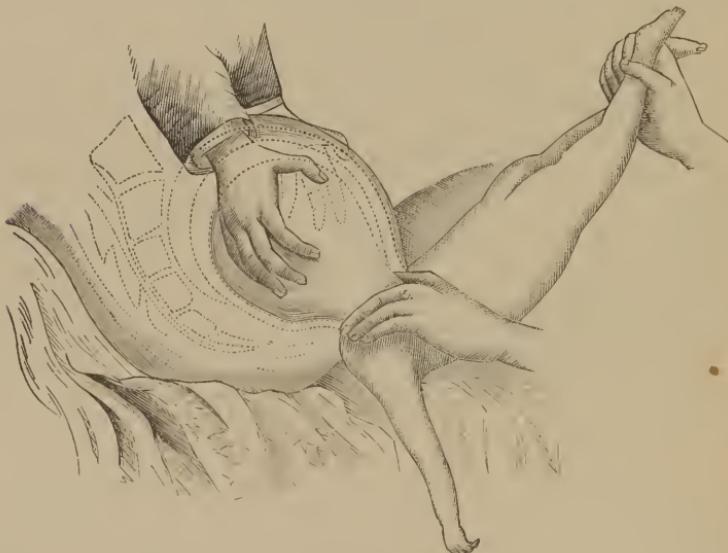


FIG. 12.

should be changed, alternating between the fundus and one of the horns of the uteruses. The less the os is dilated, the more should lateral compression be made; the more dilated and the softer is the os, the more is the compression indicated and the more effectual will it be."

The simplicity of the operation is apparent. The necessary conditions are really, strength on the part of the physician, endurance on the part of the woman, and patience on the part of both.

The mode of pressure in the expression of the after-coming head differs from that described, in that firm, steady downward and backward pressure is made without intermission on the fundus and head above the pubes, both hands being placed close together over the fundus, until the face glides over the perineum. In case it is desired to press one portion of the head into a certain part of the pelvis, the direction of the pressure may require slight modification. Of compression during an ordinary forceps operation, it is necessary only to say, that it is contemporaneous with the tractions.

C. THE EXPRESSION OF THE PLACENTA.

The method of removing the placenta by manual pressure alone, now generally known as Credé's, was not originated by that eminent obstetrician of Leipzig, nor did he make any such claim. He simply revived, systematized, and popularized an old practice which had fallen into oblivion, possibly in consequence, as Abegg says,¹ of the reaction following the too active doctrines of Osiander,² who in 1825 described the expression of the placenta substantially as it is now practised: "The accoucheur (having satisfied himself of the detachment of the placenta) twists the cord around the fingers of one hand, and with the other, pressing it deeply into the abdominal walls behind the uterus, seizes the body of the uterus and moderately compresses it. This compression is followed by the easy expression of the afterbirth, and the uniform evacuation and contraction of the uterus." Of traction on the cord nothing is said. Frictions of the abdomen are not considered by Osian-der as sufficient to cause expulsion of the placenta.

Petit³ recommended compression of the uterus with one hand until the placenta was drawn out by traction on the cord with the other. Dugés,⁴ Schmitt,⁵ Kilian,⁶ Kiwisch,⁷ Capuron,⁸ Vidart,⁹ Navas,¹⁰ and Siebold¹¹ all advised active friction of the abdomen, in connection with traction on the cord. External pressure as a means of removing the placenta was first used

¹ L. c. ² Entbindungskunst, 2. Bd., S. 196.

³ Petit : Geburtshülfe, transl. by Stark, Erfurt, 1800.

⁴ Manuel d'obstétrique, Montpellier, 1840. ⁵ Geburtsh. Abhandl., 1820.

⁶ Geburtshülfe. ⁷ Geburtshülfe. ⁸ Cours d'acc., 1836.

⁹ Arte de Partear, Madrid, 1785.

¹⁰ El. del Arte de Partear, Madrid, 1815. ¹¹ Geburtshülfe, 1854.

systematically by the English obstetricians, Wallace Johnson (1769), Charles White, of Manchester (1772), and Clarke, of Dublin. Still, Robert Lee,¹ as late as 1844, advises "gently pulling from time to time on the cord," while "compressing and squeezing the fundus uteri." Playfair² quotes the general practice from Churchill's Theory and Practice of Midwifery, "one of our most deservedly popular obstetric text-books," and reproduces a diagram, "contained in most obstetric works," as "an illustration of what ought *not* to be done." Churchill says: "When the binder is applied, the patient may be allowed to rest for a while if there is no flooding; after which, *when the uterus contracts*, gentle traction may be made upon the funis, to ascertain if the placenta be detached. If so, and especially if it be in the vagina, it may be removed by continuing the traction steadily in the axis of the upper outlet at first, at the same time making pressure on the uterus." Barnes³ says that Hardy and McClintock⁴ "insist upon the plan of causing the uterus to contract and expel the placenta by manual compression," and that it is a practice long familiar in England. However this may be, it does not appear to have been sufficiently "insisted upon," for it certainly did not become a universally adopted practice until Credé in 1853,⁵ and again in 1860,⁶ described it in terms so clear and words so warm that it rapidly became popular in Germany and soon made its way throughout the world.

As there seems to be a disposition to question Credé's claim to the authorship of the practice (Dr. Barnes but recently referred to the subject in this sense in a discussion in the London Obstetrical Society), I will quote Credé's words *verbatim*: "A single energetic contraction of the uterus rapidly concludes the process. I have succeeded in innumerable cases without exception, even with very tedious pains, within one-quarter to one-half hour after the birth of the child, by gentle, gradually increased friction of the fundus uteri through the abdominal walls, in producing an artificial and active contraction. As soon as this contraction had reached its height, I grasped the whole uterus with one hand, so as to hold the

¹ Lec. on the Th. and Pr. of Midwifery, 1844.

² Midwifery, 1878.

⁴ Practical Midwifery, 1848.

⁶ Mon. f. Geb., April, 1861.

³ Obstetric Operations, 1876.

⁵ Klin. Vortr., Berlin, 1853.

fundus in the palm, surrounded by all five fingers, and exerted gentle compression. I invariably felt the placenta slip out of the uterus from under my fingers, and usually with so much force as to be expelled from the vulva."

The now generally adopted English method, which was introduced into Germany by Spiegelberg,¹ and is still advocated by him in a modified form, differs from that of Credé, in that no effort is made to excite uterine contractions, but the hand merely follows the uterus down during and after the expulsion of the child, until the placenta is felt to leave the uterine cavity. Playfair (l. c.) describes the process as follows: After cautioning against undue haste in expressing the placenta and advising an interval of fifteen to twenty minutes after the birth of the child, in order to give time for the formation of coagula in the uterine sinuses and for the complete detachment of the placenta, before proceeding to remove that body, he says: "During this interval the practitioner or nurse should sit by the bedside, with the hand on the uterus, to secure contraction and prevent distention; *but not kneading or forcibly compressing it.*" When we judge that a sufficient time has elapsed, we may proceed to effect expulsion. For this purpose the fundus should be grasped in the hollow of the left hand, the ulnar edge of the hand being well pressed down behind the fundus, and *when the uterus is felt to harden*, strong and firm pressure should be made downward and backward in the axis of the pelvic brim. If this manœuvre be properly carried out and sufficiently firm pressure made, in almost every case the uterus may be made to expel the placenta into the bed, along with any coagula that may be in its cavity. . . . If we do not succeed at the first effort, which is rarely the case, if extrusion be not attempted too soon after the birth of the child, we may wait until another contraction takes place, and then reapply the pressure. I repeat that, after a little practice, the placenta may be entirely expelled in this way in nineteen cases out of twenty, without even touching the cord, and the bugbear of retained placenta will cease to be a source of dread."

This difference in the two methods entitles Credé to the priority of having established a systematic process for pla-

¹ Würzburg. Med. Zeitschr., 1861, Bd. 2.

² Italics are mine.

central expression; the English method and that of Spiegelberg, now to be described, are but subsequent modifications.¹

Spiegelberg¹ describes and recommends a method which is a combination of and, I think, judging from personal experience, an improvement on the other processes. His book has not been translated as yet, and his practice in detail is, therefore, in all probability unknown to the profession here. It includes directions prohibited by the followers of Credé's and the English method, but which the eminence of Spiegelberg as a practical obstetrician renders worthy of consideration and belief. I shall, therefore, translate the respective section of his work in full. After describing the manner in which one hand supports the perineum, after the expulsion of the head, while the other follows the fundus during its descent and the expulsion of the rest of the child, in order to be ready to use expression in case of delay; and after advising the double ligation of the cord, in order to retain the placental blood, whereby its expulsion is facilitated (in all of which, and the removal of the child, the nurse should assist), he proceeds:

"In the mean while the hand guarding the uterus has not been removed. After the birth of the child, it devotes itself more particularly to the uterus, which is first brought into the median line, vertically to the axis of the brim. The hand then grasps the uterus, the ulnar border pressing in deeply behind it, the fundus in the open hand, the thumb on the anterior surface. When a pain now occurs, the anterior uterine wall is pressed against the posterior and the whole organ slightly toward the pelvic brim, this pressure being discontinued when the pain eases. If the pains are too scanty and too feeble, the fundus is rubbed and kneaded with the flat hand, until a contraction ensues, and then pressure is made as above directed. When this has been repeated several times, the flattening of the uterine body shows that the placenta has been expelled from it. Then by means of strong downward pressure of the whole organ, in the direction of the axis of the inlet, the whole afterbirth can be driven into and out of the vagina (*expressio placentæ*), which manoeuvre is greatly favored by straining on the part of the woman and an elevation of her sacrum. This expression out of the vagina is not necessary, however, very frequently even exceedingly painful, and therefore occasionally

¹ Lehrb. der Geb., 1878: I., p. 190.

impracticable. It is, therefore, preferable to remove the placenta, when it has left the uterus, by traction on the cord, aided by pressure on the uterus; the traction should be backward and downward, upward only on the extrusion of the placenta. If the latter does not readily yield, two fingers should be passed along the cord to or near its insertion, and the placenta pressed into the sacral excavation, while the fingers of the other hand draw the cord in the proper direction. . . . The extrusion of the placenta from the vulva should always be slow, in order not to tear off the membrances which often are still retained in utero, etc. . . . This method of removing the afterbirth is by no means identical with that known as Credé's. While in the latter the hand is not placed on the uterus until after the complete expulsion of the child; and by friction, etc., that is, by irritating the organ, contractions are produced and the placenta then expressed in the manner described, the method thus being virtually an expression of the afterbirth—I, after the example of the Dublin Rotunda, lay especial stress on *speedy* regular, that is, uniform, contractions of the uterus, because they produce the detachment of the placenta, which, and not its expression, is the main point. And while I, by constantly watching the uterus during the whole period of its relatively rapid evacuation, that is, from the moment of the expulsion of the head, follow it up and thereby irritate it mechanically, I make the contraction necessarily accompanying its sudden evacuation, not only energetic, but uniform, and thus attain speedy detachment, and by continual watching eventually prevent irregularities of contraction. While with Credé's method anomalies of contraction may develop unobserved, between the expulsion of the child and the commencement of the method, this is impossible with mine. To recapitulate: Constant supervision of the uterus from the moment of expulsion of the head, thereby induction of general contraction and detachment of the placenta—the main object; its expression may then follow; necessary it is not. Indeed, it may often be very painful and not seldom impracticable. This is also the only and most certain prophylaxis against disturbances of the third stage, so far as they can be prevented."

It is apparent from this description that Spiegelberg's method again differs from its parent, the English, in that he allows

no interval of rest between the complete expulsion of the child and the removal of the placenta, instead of the fifteen to twenty minutes advised by Playfair. Barnes¹ even says: "It is 'meddlesome' and injurious to practise it (expression) immediately after the delivery of the child," and, "timely applied 'expression' aids and is aided by natural contractile efforts." Leishman's² directions conform very closely to those of Spiegelberg.

Fritsch³ advises the immediate expression of the placenta after the birth of the child, with no intermission, keeping his hand steadily on the fundus, and compressing the uterus with one or both hands (if one is insufficient to grasp it) during a

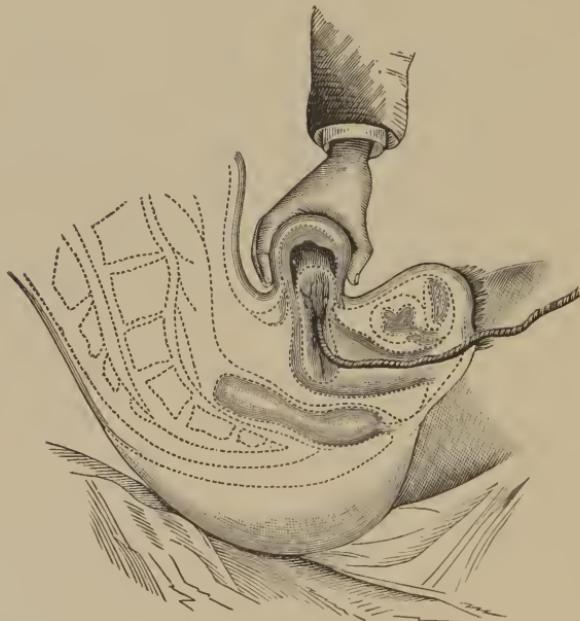


FIG. 13.

contraction in the axis of the brim. He calls this Credé's method, although it really resembles more that of Spiegelberg in being continuous. Fritsch says that, since he has practised this plan, he has scarcely observed a case of post-partum hemorrhage; and his experience extends over numerous normal and more than three hundred operative deliveries. He claims

¹ L. c., p. 522.² Midwifery, 3d Am. Ed., 1879.³ L. c., p. 330.

that this result is due to the induction by immediate expression of the definite puerperal contraction of the uterus, instead of allowing the organ to dilate and then exciting it to contraction. He does not speak of guiding the detached placenta out by the cord.

The method which I have been in the habit of practising for years is very similar to that recommended by Spiegelberg. While, no doubt, in my early obstetric practice my occasional failure to express the placenta depended on inexperience and neglect to grasp the uterus thoroughly in the palm of the hand and direct the propulsive force downward and backward (Fritsch explains the usual failure of students in his clinic, and the easy success of the assistant on the same grounds), still, as my experience increased, I found cases in which one hand alone would not succeed, others in which both hands failed, and others again in which the placenta had evidently left the uterine cavity proper, but could not be expressed from the vagina. In the last-mentioned cases I found *gentle, careful* traction on the cord of the *already detached* placenta, which was either retained in the cervix by the internal os, or had really passed partly or wholly into the vagina, to be not only entirely safe, but decidedly effectual in securing its removal. In other cases, prolonged gentle friction of the uterus was indispensable, to secure the detachment of the placenta, before which detachment even the most forcible expressive power was in vain. Whether or not the placenta was detached was readily ascertained by the palpating hand, which would feel (often the eye could see) one or the other uterine horn projecting above the other; evidently the remainder of the uterus was contracting, while the placental site was passive. As soon as the latter also contracted, the uterus would assume a smooth, spherical contour, and then expression would prove effective. But this friction, with occasional trials of expression, might last fifteen minutes or more; seldom have I found it exceed the quarter-hour.

It is, of course, important to know when the placenta is really detached, and for this purpose a knowledge of palpation is essential. I have repeatedly been called to remove the placenta, and found it loose in the cervix or vagina, the medical

attendant having been very properly afraid to disobey the directions of the modern method, and draw on the cord.

I have very frequently found it much less painful to the patient and fatiguing to the physician to draw *gently* on the cord as soon as the palpatting and expressing hand shows that the placenta has escaped from the cavity of the uterus, and thus guide it over the perineum, where it is received by the right hand and gently withdrawn with a twisting motion, so as to make a cord of the membranes, rather than attempt to force the placenta out of the vagina by supra-pubic pressure. In very many instances I have been able to verify Credé's statement as to the force with which the placenta may be expressed; indeed, I remember one case in which the placenta was expressed by the head midwife with such force as to strike me, who had stepped some two feet from the "pony-bed," to explain the case to the students, full in the back. But, in my experience, the proportion of cases is quite large in which *gentle* traction on the cord will be found a useful auxiliary.

Briefly, my practice is as follows: When the end of the second stage approaches and the head begins to protrude the perineum, the patient is turned on her left side. If the case be a primipara, the nurse is instructed to exert steady downward pressure on the fundus with both hands as soon as the head is expelled, while I guard the perineum and deliver the head after the Ritgen-Goodell method above described, two fingers of left hand in rectum, right hand supporting the occiput. If she be a pluripara, I myself follow the uterus down with the left hand until the child is expelled. The woman is then again turned on her back, a teaspoonful of fluid extract of ergot given, and gentle friction made by the hand on the fundus until the cord ceases to pulsate, when the cord is doubly ligated and cut, and the child given to the nurse; the hand is then (its place having been supplied by that of the nurse during this short interval) replaced over the uterus, and gentle friction continued until the uterus contracts uniformly, as above described; as soon as this occurs, the uterine sphere is grasped by the whole left hand, or if necessary by both hands, and gently compressed toward the axis of the brim; if the placenta is not then felt to escape (as shown by the immediate decrease in size of the uterus),

the friction is recommenced, and expression again tried, until the afterbirth is expelled. Unless it voluntarily emerges between the labia, gentle backward traction is made on the cord, or even one finger and the thumb may be passed into the vagina, to seize the nearest portion of the placenta, and start it. In no case, of course, is traction to be continued when the attachment of the cord is felt to be slender or yielding. In such cases, or if there is some particular reason why the fingers should not be passed into the vagina (as, danger of infection), two fingers may be passed into the rectum and the placenta lifted out of the vagina after the Ritgen-Goodell method of delivering the head.

As soon as the placenta has been removed, gentle steady friction is kept up over the fundus, with occasional expression of coagula, until permanent contraction ensues, which may occupy half an hour, or, in doubtful cases, a longer period. Then, if necessary, a compress is laid over the fundus, and a binder applied, which latter article is used more as a comfort and support to the woman than because it is absolutely necessary for her subsequent recovery.

The essentials of success in expressing a placenta are :

1. Expression only during a uterine contraction; and, 2. Expression in the proper direction, through the pelvic brim. If these conditions are properly observed, any person qualified to conduct a normal labor can successfully express the placenta. The old method of *forcible* traction on the cord, which doubtless is still very generally practised by many physicians and most midwives, should be utterly prohibited.

The advantages of expression of the placenta, as above described, are obvious. They may be briefly enumerated as follows: The avoidance of the introduction of the hand into the vagina and uterus, and of forcible traction on the cord, and, therefore, of possible direct septic infection, tearing out of the cord and sudden inversion; further, the prevention of hemorrhage, and the speedy expulsion of the placenta by propulsion, the natural mechanism.

Disadvantages there are none, except those mentioned in the next section, and injuries to the uterus from careful, steady, not too violent, expression have not been known to occur. One warning it may be well to mention, and that is, not to make

unequal pressure on the uterus, particularly not on the relaxed placental site, which, if the remainder of the organ chance to be flabby, might possibly produce partial or complete inversion.

Difficulties attending expression of the placenta: The same obstacles to expression of the fetus—hyperesthesia, inflammatory affections, or obesity of the abdomino-uterine walls—will naturally also interfere with placental expression to a greater or lesser extent. The chief obstacle to expression of the placenta is its pathological adherence. When friction and expression have been exercised in vain for some time, and the uterus neither contracts down to a firm, smooth ball, nor is the placenta expelled, then we may fairly assume that it is more or less adherent. When the uterus has contracted down after the child and has its normal size, the placenta *must* be detached and have left the uterine cavity proper.¹ Since the adoption of placental expression, adhesion of the organ has become very much less frequent than formerly. Fritsch says: "Credé has the great merit of having deprived bad obstetricians of the excuse of adherent placenta." Among 9,839 labors collected by Ulsamer in 1827 (when expression was not yet in use), there were 143 cases of artificial detachment (12.7 per cent). Still, only in 3 cases was the placenta adherent throughout, and in 12 cases there were partial or tendinous adhesions. Among 3,267 labors occurring at the Würzburg Maternity from 1863 to 1873 (during three of which years I was house surgeon) it was found necessary to detach the placenta 25 times (0.7 per cent), in only 11 of which cases there was firm pathological adhesion. In the others, hemorrhage and hour-glass contraction were the causes.

Another obstacle to expression is a spasmotic contraction at the internal os, or at either horn of the uterus. This is called by Barnes "encystment." It is not uncommonly mistaken for actual adherence. The placenta is detached and lies loose above the constriction, which cannot be overcome by expression. It is generally necessary to dilate the constriction and remove the placenta manually. Positive adhesions must be severed by the hand *in utero*; expression will not succeed. The expression of the placenta, in a

¹ Fritsch, p. 334. I think this statement should be modified to read, "more or less detached."

greatly premature delivery, may occasionally fail, either because the organ is very small and lax, or the child is dead.

A precaution which should never be omitted is, to inspect the placenta immediately after its delivery, particularly the maternal surface. Should any cotyledons be found missing, search should be made for the missing portion by introducing the hand into the uterus, where the cotyledon may be found either adherent or loose. Fritsch reports three cases of the latter occurrence, after the ready success of Credé's method, all the placentæ being somewhat pulpy.

Supervision of the fresh puerperal uterus. Immediately after the removal of the placenta, the uterus will be felt by the palpating hand as a firm, hard ball of the size of a child's head, some three to four inches above the pubes. Frequently, one circumscribed portion or other of the fundus, corresponding to the prominence previously felt, will now be found depressed and soft, showing the slightly inverted site of the placenta. This Fritsch calls a "normal physiological paralysis of the placental site." It soon disappears with the uniform contraction of the uterus induced by gentle friction, which should be continued for one-quarter to half an hour after delivery, until the danger of hemorrhage is past. Ramsbotham¹ and Osiander,² as long as fifty years ago, recommended steady, tonic, compression of the bleeding puerperal uterus, to be continued, if necessary, for half an hour or longer, and clearly distinguished it from the friction long practised for the same purpose. Not uncommonly relaxation of the uterus takes place several hours after labor, and oozing of blood occurs into the uterine cavity, distending it frequently to double its normal size. I have repeatedly expressed clots of the size of a fist from the uterus three or four hours after labor. But this was at a time when I was not in the habit of giving ergot simultaneously with the birth of the head in every case, as I now do. The advisability, therefore, of palpating the abdomen of every puerpera at intervals within twelve hours after delivery, is apparent. I always instruct the nurse to watch the size and tension of the uterus, and show her how high the fundus should normally stand; in the absence of a nurse, the patient herself may be taught to feel and watch over her uterus.

¹ Pract. Obser. in Midwifery, 1821.

² F. B. Osiander: Entbindungskunst, Bd. III., 1825.

A secondary hemorrhage at a later period than twenty-four hours post partum generally depends on some condition not remediable by external manipulation alone.

The external compression of the abdominal aorta, which has been extolled with doubtful reason as a hemostatic in post-partum hemorrhage, is warmly recommended by Fritsch as a rapid analeptic in syncope from the same cause. It acts obviously by retaining the blood in the brain and upper section of the body.



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